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ABSTRACT

This document is designed to provide practical information for teaching the Biology 20-30 Program of Studies. The first section provides an overview of Biology 20, explaining the program philosophy and depth of coverage of some of the objectives. The use of concept connections and teaching a course around major science themes is described, as well as how the program articulates with the junior and senior high science courses. Section two contains four units. Unit one, "The Biosphere," demonstrates the nature of science through the use of model building. Unit two, "Energy Flows and Cellular Matter," deals with energy and matter cycling through the subcellular systems. Unit three, "Energy and Matter Exchange in Ecosystems", provides a linkage between the biosphere and the cellular phenomena discussed in the two previous units by studying energy and matter flow in certain diverse ecosystems. Unit four, "Energy and Matter Exchange by the Human Organism," examines physiological processes that mediate the interactions between organisms and their environment. The final section provides detailed information on a great variety of resources that support the implementation of this program. (ZWH)

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BIOLOGY 20–30

BACKGROUND, EXEMPLARS AND RESOURCES

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BIOLOGY 20–30

BACKGROUND, EXEMPLARS AND RESOURCES

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PREFACE

Biology 20–30 Background, Exemplars and Resources, 1994 is designed to provide practical information for teachers implementing the Biology 20–30 Program of Studies provided with this resource, which outlines what students are required to learn.

BACKGROUND

This section provides an overview of Biology 20, explaining the program philosophy and the depth of coverage of some of the objectives. Strategies for the use of concept connections and teaching a course around major science themes are examined. The program's articulation with the junior and senior high science courses is clearly demonstrated and guidelines for the proper classroom care of plants and animals is outlined.

EXEMPLARS

Exemplars are lesson outlines that closely follow the learning cycle set out in the specific learner expectations section of the Biology 20–30 Program of Studies. They provide models of how Biology 20 classroom activities can be structured to effectively accomplish the program objectives and include suggestions for assessment and evaluation of such activities. The strategies can be easily generalized to the Biology 30 situation.

RESOURCES

The resource lists in this section provide detailed information on a great variety of resources that support the implementation of this program. These resources include authorized teaching background resources, basic student learning resources, support learning resources for students and many other resources not authorized but deemed useful for specific parts of the Biology 20–30 program. As far as possible, resources are keyed to specific units of study. Detailed annotations, distributor information and approximate prices for each resource listed are provided.

A senior high science teacher will find it useful to have both the *Senior High Science Teacher Resource Manual,* 1992 (Interim) and the *Biology 20–30 Background, Exemplars and Resources,* 1994. The two are designed to work together, avoiding repetition of material common to all science programs.

The following documents support the senior high science curricula:

Science 16 Teacher Resource Manual, 1990 (Interim)
Science 26 Teacher Resource Manual, 1991 (Interim)
Science 14–24 Teacher Resource Manual, 1989
Senior High Science Teacher Resource Manual, 1992 (Interim)
Science 10 Teacher Resource Manual, 1992 (Interim)
Biology 20–30 Background, Exemplars and Resources, 1994
Chemistry 20–30 Background, Exemplars and Resources, 1994
Physics 20–30 Background, Exemplars and Resources, 1994
Science 20–30 Background, Exemplars and Resources, 1994

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BACKGROUND

BACKGROUND TO THE BIOLOGY 20 PROGRAM

by George Cormie

The major science themes developed in Biology 20 are energy, equilibrium, matter and systems with change and diversity as subordinate concepts that are also addressed.

The Biology 20 program continues to develop the themes that were first addressed in Unit 1 and Unit 2 of Science 10. The major science themes developed in Biology 20 are *energy*, *equilibrium*, *matter* and *systems* with *change* and *diversity* as subordinate concepts that are also addressed.

Unit 1 develops the concept that a constant flow of *energy* is necessary to maintain the biosphere as a *system*. The role of the Sun in providing the radiant *energy* to heat the Earth and to drive photosynthesis is studied. In the biosphere, although most of the *energy* from the Sun is initially stored by photosynthetic activity, it is subsequently released by cellular respiration. Earth's elements as substrates for life are discussed during an examination of the biogeochemical cycles of carbon, oxygen and nitrogen, with an examination of the roles of living *systems* in that cycling. The study of the nature of water is continued from Science 10 with a survey of the hydrologic cycle. The unit closes with a discussion of the balance of the *energy* and *matter* exchange in the biosphere and the impact of living *systems* and human activity on the natural composition of the atmosphere.

In Unit 1, the nature of science is demonstrated through the role of model building to explain the nature of the cycling phenomena. Some methods of obtaining the information to put into those models can be examined as laboratory experiences. The impact of human populations on biogeochemical and hydrologic cycles can be used to illustrate the connections among science, technology and society.

It is not the intent of this unit that students learn the molecular details of the Calvin–Benson cycle and Krebs cycle.

Unit 2 deals with *energy* and *matter* cycling through subcellular *systems*. Photosynthesis is studied as the process that obtains *energy* from the environment and stores it in organic compounds. The site of photosynthesis, the light reactions, and the Calvin–Benson cycle are discussed. Cellular respiration is studied as the process that releases the stored energy from carbohydrates and other organic molecules. The site of cellular respiration, and the basic reactions of glycolysis and Krebs cycle are discussed. This unit describes, in general terms, how chemiosmosis converts reducing power to adenosinetriphosphatase (ATP), and that this form of potential *energy* can be used to do useful work in cells. The associated cyclical fluxes of carbon in a variety of organisms are outlined in general. It is not the intent of this unit that students learn the molecular details of the Calvin–Benson cycle and Krebs cycle.

The nature of science as a means of explaining phenomena at different levels of organization by using underlying principles is developed in Unit 2. The *systems* under study are examined by observation, description and experimentation to develop the students' science processing skills. The science, technology and society linkage is established by discussing the nature of photosynthesis as the biological process upon which Alberta's agriculture and forestry industries are based.

Unit 3 provides a linkage between the biosphere and the cellular phenomena discussed in the two previous units by studying *energy* and *matter* flow in certain diverse ecosystems, specifically, one aquatic ecosystem and one terrestrial ecosystem. The concept that the biosphere is composed of a variety of ecosystems with characteristic biotic and abiotic factors is developed. Ecosystem structure is examined with an emphasis on *energy* and *matter* exchange within the ecosystem. It is the intent of the unit that the chosen ecosystems be close to the place of learning and familiar to the learners. The unit closes by reviewing changes in the basic component of ecosystem structure, populations; with a focus on the process of organic evolution by natural selection. That process provides a model *system* to explain how the production of *diversity* allows the selection of organisms better adapted for the roles they play in their respective ecosystem.

It is the intent of the unit that the chosen ecosystems be close to the place of learning and familiar to the learners.

The nature of science can be examined by analyzing how scientific theories are built and tested. The differences in hypothesis testing in biology compared to other natural sciences can be discussed. To examine the relationships among science, technology and society, students can compare scientific ways of knowing with other ways of knowing.

To examine the relationships among science, technology and society, students can compare scientific ways of knowing with other ways of knowing.

Unit 4 examines physiological processes that mediate the interactions between organisms and their environment. How this interaction helps maintain an organism's metabolic *equilibrium* is examined. The human organism, because it is personal and relevant to the learner, is used as a model *system* to study these interactions. The unit builds on previous learning from Science 10 on energy and matter in living *systems* and on the other units in this course. *Energy* and *matter* are exchanged between humans and their environment during the processes of respiration, digestion and excretion. Not all cells in the human body exist at the interfaces where these processes take place. To support all the cells in the body these processes are carried out with the aid of a circulatory *system*. That circulatory *system* is also part of a defence *system* that plays a major role in regulating the biotic interactions between pathogenic organisms from the environment and the human organism to maintain metabolic equilibrium.

The human organism, because it is personal and relevant to the learner, is used as a model system to study these interactions.

In this unit, the nature of science is examined at the organism, organ system, organ, tissue and cellular levels of organization with the assistance of experimental work. Students will be required to present the results of their investigations as drawings, graphs and tables in a report format. The role of technology in maintaining *equilibrium* through exchanges with the environment or the circulation of transport fluids is evaluated. The relationships among science, technology and society can be examined in the context of preventing the transmission of communicable diseases and the ethics of mainlining the exchange *systems* by technological means.

PROGRAM ARTICULATION

Theme	Junior High	Science 10	Biology 20
Change	Life cycles Weathering Environmental change Soil Intentional and unintentional environmental alterations Natural selection Human actions and the environment	Water Weather systems Cell division and growth Photosynthesis Energy transformations	Evolution of organisms Ecosystem changes over time The biosphere Photosynthesis Respiration Digestion Excretion Molecular biochemistry
Diversity	Variation in organisms Artificial selection Plant propagation and structure Soil types Specialized life forms Adaptation of living things Artificial selection Classification of living things	Diversity of climate Diversity of structure and function in living organisms Energy exists in a variety of forms Matter occurs in a variety of forms	Evolution of organisms Variation in organisms Speciation and natural selection Ecosystems are composed of a diversity of life forms Inheritable variations and adaptation
Energy	Thermal energy Maintenance of living systems Plant growth Energy flow within an ecosystem Solar energy Chemical change	Solar energy sustains life on Earth Solar energy drives weather systems Energy exchange between organism and environment Energy transformation Simple calorimetry	Photosynthesis Respiration Food webs and chains Active transport requires a respiratory system Cellular respiration Circulatory systems connect the cells with their external environment

Theme	Junior High	Science 10	Biology 20
Equilibrium	Dynamic equilibrium in ecosystems Dynamic balance between abiotic and biotic factors and ecosystems Pollutants and the environment	The balance between solar energy absorbed and lost by Earth Energy cycles Water as buffers to climate change Hydrologic cycle Carbon cycle	The biosphere as a system Biogeochemical cycles Metabolic homeostasis Photosynthesis and respiration balance Populations and communities interaction Ecosystems and their biotic and abiotic components Biochemical equilibrium Immune systems
Matter	Matter and temperature change Chemical composition Chemical and physical properties of matter Acidity and pH	Matter has mass and occupies space Properties of water Matter exchange in cells Chemical bonding	Exchange between human organisms and the environment Biogeochemical cycles Cellular processes Photosynthesis Trophic levels Ecosystems Food webs and chains Transport, digestive, respiratory and excretory systems
Systems	Living organisms can be considered systems Ecosystems Flow of matter in ecosystems Abiotic and biotic factors of ecosystems	The Earth Weather The oceans and atmosphere The cell and multicellular groups Systems for acquiring nutrients, eliminating waste and gas exchange Energy systems	The biosphere Ecosystems Human organisms and their organs and organ systems Natural selection Immune systems

ANIMAL AND PLANT CARE

by George Cormie

Keeping animals in the classroom for study and for handling can be a valuable asset to the science program. To ensure the health and safety of both students and study animals, the following guidelines are suggested.

1. The teacher should check whether or not students have allergies before bringing animals into the classroom. This can usually be done by simply asking the children if they have allergies. For younger children it is wise to check either their medical records or send a note home advising the parents of the animals to be kept.

   In case of a mild allergy, it may be possible to maintain the animal in the classroom but not allow the child to handle it. For more serious allergies, the animal may have to be kept somewhere other than the regular classroom. In some extreme cases, the keeping of animals may have to be ruled out entirely.

2. The animals should be obtained from a known, reputable supplier. They should be in good health and of good disposition.

3. No child should be allowed to bring an animal into the classroom without the permission of the teacher.

4. Animals should be kept in suitably sized enclosures that can be easily maintained and cleaned.

5. The animals should be well fed and cared for.

6. If a mammal or bird appears to be in poor health, it should be checked by a veterinarian to identify the problem. Many animal ailments are infectious to humans so, if there is any doubt, the animal should be removed from the classroom area until the problem has been identified and corrected. In the event that an infectious ailment is detected, the veterinarian's recommendations should be followed and parents of students who have handled the animal should be advised.

7. Students should be advised regarding the safe handling of animals. Note that most animals will bite if handled roughly or if handled at an inopportune time; e.g., hamsters are not at all friendly when they have just awakened or when food is taken away from them. Caution students that too much handling by too many students may be stressful for the animal. Hands should be washed after handling animals.

8. An animal who bites should not be kept in the classroom. If an animal has bitten a student sufficiently hard to break the skin, the student's parents should be advised. As a normal precaution, the student who was bitten should receive a tetanus shot, if he has not had one recently.

9. An animal should be kept in the classroom only so long as it is a meaningful part of the program. An animal who is being neglected is both a health hazard and a negative learning experience for the students.

SUITABLE CLASSROOM STUDY ANIMALS

Mammals	rabbit, guinea pig, hamster, gerbil, mouse
Birds	baby chicks and ducks (for short periods), budgerigars, canaries, pigeons, doves
Reptiles	chameleons, small snakes
Amphibians	aquatic frogs, newts, tadpoles hatched from frog eggs
Fish	goldfish, guppies, tropical fish
Insects	aphids, mealworm beetles, ladybird beetles (ladybugs), caterpillars, fruit flies, milkweed bugs
Crustaceans	isopods, crayfish, tree crabs
Worms	earthworm
Pond Water Organisms	gamerus, fairy shrimp

Animals That Should Not Be Kept

No native species of wild animal or bird should be kept in the classroom. To do so would create an unwarranted source of possible infection. In most cases, the keeping of these mammals or birds is unlawful. For details, see the *Alberta Wildlife Act* or contact your local wildlife office.

Plants in the Classroom

Just as some students may be allergic to particular types of animals, students may also be allergic to certain types of plants; e.g., fuzzy-leafed plants, such as African violets. The teacher should identify any allergic reactions and eliminate using such plants in the classroom.

Teachers of younger children should also be aware that some plant leaves are poisonous; e.g., Dieffenbachia.

Experimental Studies

1. The use of plants and animals must comply with existing local, provincial and federal legislation.

2. All experiments should be carried out under the supervision of a competent science teacher. It is the responsibility of the qualified science teacher to ensure the student has the necessary comprehension for the study to be undertaken.

3. All organisms used in teaching programs must be properly cared for. Consideration should be given to:

    - proper housing and space
    - proper lighting and temperature requirements
    - adequate ventilation
    - adequate water and food with proper nutritional requirements
    - provisions for sanitation.

4. All students carrying out projects involving **vertebrate animals** must adhere to the following guidelines:

    - students should not be allowed to take animals home to carry out experimental studies. All studies involving animals must be carried out in a suitable area in the school
    - no experimental procedures should be attempted on a vertebrate animal that would subject it to pain or distinct discomfort, or interfere with its health
    - students should not perform surgery on vertebrate animals
    - experimental procedures should not involve the use of:
        - microorganisms that can cause disease in humans or animals
        - ionizing radiation
        - cancer-producing agents
        - drugs or chemicals at toxic levels
        - alcohol in any form
        - drugs that may produce pain
        - drugs known to produce adverse reactions, side-effects, or which are capable of producing birth deformities

- experimental treatments should not include electric shock, exercise until exhaustion, or other distressing stimuli

- the use of anesthetic agents by students is not encouraged and, in the case of some anesthetics, is not permitted by law

- behavioural studies should use only reward (positive reinforcement) and not punishment in training programs

- if egg embryos are subjected to experimental manipulations, the embryo must be destroyed humanely two days prior to hatching. If normal egg embryos are to be hatched, satisfactory humane arrangements must be made for disposal of the young birds

- all animals must be disposed of in a humane manner. If euthanasia has to be carried out, an approved humane method must be used and performed by an adult experienced in such procedures.

EXEMPLARS

BIOGEOCHEMICAL CYCLES

This exemplar addresses the following ***Program*** and ***Course*** **General Learner Expectations** and the **Specific Learner Expectations** from the Biology 20 course of studies.

Program General Learner Expectations

The **themes** emphasized are *energy, equilibrium, matter* and *systems.*

The aspects of the **skills framework** emphasized are:

Initiating and Planning

- identifying and clearly stating the problem or issue to be investigated
- differentiating between relevant and irrelevant data or information
- assembling and recording background information
- formulating questions, hypotheses and/or predictions to guide research

Collecting and Recording

- carrying out the procedure and modifying, if necessary
- organizing and correctly using apparatus and materials to collect reliable experimental data

Organizing and Communicating

- organizing and presenting data (themes, groups, tables, graphs, flow charts and Venn diagrams) in a concise and effective form
- communicating findings of investigations in a clearly written report

Analyzing

- analyzing data or information for trends, patterns, relationships, reliability and accuracy
- identifying assumptions, attributes, biases, claims or reasons

Connecting, Synthesizing and Integrating

- predicting from data or information
- identifying further problems or issues to be investigated
- identifying alternatives for consideration
- proposing and explaining interpretations or conclusions

Evaluating the Process or Outcomes

- establishing criteria to judge data or information
- considering consequences and perspectives
- evaluating and assessing ideas, information and alternatives

The **STS connections** emphasized are:

- the central role of experimental evidence in the accumulation of knowledge, and the way in which proposed theories may be supported, modified or refuted
- the influence of the needs, interests and financial support of society on scientific and technological research
- the ability and responsibility of society, through science and technology, to protect the environment and use natural resources judiciously to ensure quality of life for future generations

Course General Learner Expectations

Knowledge

- explain how equilibrium in the biosphere is maintained by the flow of energy from the Sun through the chemical processes of photosynthesis and cellular respiration, and by the cycling of matter through the biogeochemical cycles; and describe the influence of human activities on the equilibrium of energy and matter exchange and atmospheric composition

Skills

- perform investigations and tasks of their own and others' design that have a few variables and yield direct or indirect evidence; and provide explanations based upon scientific theories and concepts
- collect, verify and organize data into tables of their own design, and graphs and diagrams of others' design, using written and symbolic forms; and describe findings or relationships, using scientific vocabulary, notation, theories and models

STS Connections

- apply cause and effect reasoning to formulate simple relationships for a given instance in which scientific evidence shapes or refutes a theory; and describe the limitations of science and technology in answering all questions and solving all problems, using appropriate and relevant examples
- explain for a given instance how science and technology are influenced and supported by society, and the responsibility of society, through biology and technology, to protect the environment and use natural resources wisely

Major Concept 2

The cycling of matter through the biosphere perpetuates its steady state equilibrium.

Specific Learner Expectations

Knowledge

- summarizing and explaining the biogeochemical cycles for carbon, nitrogen and phosphorous

Skills

- predicting disruptions in nitrogen and phosphorous cycles caused by human activities
- hypothesizing how alterations in the carbon cycle, as a result of the burning of fossil fuels, might influence other cycling phenomena
- designing an experiment to compare carbon dioxide production by plants with that of animals

STS Connections

- analyzing how society affects the biogeochemical cycle of carbon, which in turn influences the greenhouse effect

- discussing the influence of agricultural products or processes on the biogeochemical cycle of phosphorous and nitrogen

Introduction

Discuss the cost of food production in developed countries versus the cost of food production in underdeveloped countries; what the term "organic food production" means, and the trend in its direction.

Research and prepare charts/tables of basic food costs worldwide—developed versus underdeveloped countries—with a focus on inorganic/organic fertilizers and their costs.

OR

Discuss the eutrophication of recreational lakes (case studies of a specific lake) with focus on the major contributing factors and their sources—primarily nitrogen and phosphorous, although the thermal aspect of pollution can be linked to the carbon cycle and fossil fuels.

Experiential Exploration

Have a class field trip to a local fertilizer manufacturer (not a retail distribution centre for fertilizer). Optional—guest speaker from a fertilizer manufacturer or chemical plant that produces the raw materials. The most important aspect here is cost to produce and cost to the consumer (farmer).

OR

Activity to test the relative amounts of nitrogen, phosphorous and potassium in a variety of commercial fertilizers and garden compost. Test kits can be purchased from suppliers, or the materials assembled in class. Samples of the fertilizers can be brought from home or picked up from fertilizer companies or retail outlets.

Hypothesis-building

Based on previous learning and activities, (Science 10, Unit 2, Major Concept 1 and Unit 2, Major Concept 4) use a class discussion to help students develop an understanding that:

- carbon, nitrogen and phosphorous can come from a variety of natural, societal and industrial sources
- disruptions in the natural cycles of carbon and oxygen may be caused by human activities
- serious disruptions of carbon and oxygen cycles can have global implications (greenhouse effect).

Through a directed class discussion, help students come to understand:

- historically, plants and animals have maintained a balanced system with respect to environmental levels of nitrogen and phosphorous
- how nitrogen, phosphorous, carbon and oxygen cycle through the biosphere.

Elaboration

Design and perform an activity to demonstrate the influence of temperature and/or nutrients; e.g., nitrogen and phosphorous, on the growth of algae in small, closed aquatic ecosystems. Organisms, such as euglena, are suitable for this activity because they are inexpensive, grow well in small containers, reproduce rapidly and population numbers can be assessed, quantitatively, by microscopic examination.

Application

Research and design an experiment to measure and compare the amount of carbon dioxide produced by plants and animals. Although some activities of this nature may be carried out on plants in the classroom, many are not suitable for animals.

Carry out an activity demonstrating that decay and composting can produce greenhouse gases and that one of these gases is carbon dioxide.

Design and perform an experiment demonstrating mineral deficiencies in plants.

Significance

Have students debate the pros and cons of having a sanitary landfill in their immediate area.

Groups of students could interview individuals—presented later in class or written and submitted—on:

- the recreational impact of lake overproduction (eutrophication)
- natural versus organic farming
- sewage treatment alternatives
- the hidden cost of food—packaging and its impact.

Evaluation

- Tests, Quizzes and Exercises
  - knowledge quizzes on components of the biogeochemical cycles of carbon, nitrogen and phosphorous
  - draw/describe/explain the biogeochemical cycles
  - have students explain some aspect of composting/recycling
  - worksheets for review

- Activities
  - written reports on each of the activities
  - observe students (checklists)
  - mark models/charts/assignments
  - mark single aspects of activities
  - peer evaluation

- Investigations
  - written reports on fossil fuel consumption, fertilizer use, or the greenhouse effect
  - oral report on single concepts
  - critique on a news article
  - written report/essay on a relevant topic
  - assess a specific skill

THE RELATIONSHIP BETWEEN OXYGEN AND ATP IN CELLULAR RESPIRATION

This exemplar addresses the following ***Program*** and ***Course*** **General Learner Expectations** and the **Specific Learner Expectations** from the Biology 20 course of studies.

Program General Learner Expectations

The **themes** emphasized are *energy*, *matter* and *systems*.

The aspects of the **skills framework** emphasized are:

Initiating and Planning

- identifying and clearly stating the problem or issue to be investigated
- assembling and recording background information
- identifying all variables and controls
- identifying materials and apparatus required
- preparing required observation charts or diagrams

Collecting and Recording

- carrying out the procedure and modifying, if necessary
- organizing and correctly using apparatus and materials to collect reliable experimental data
- accurately observing, gathering and recording data or information according to safety regulations; e.g., Workplace Hazardous Materials Information System (WHMIS), and environmental considerations

Organizing and Communicating

- organizing and presenting data (themes, groups, tables, graphs, flow charts and Venn diagrams) in a concise and effective form

Analyzing

- identifying and discussing the sources of error and their affect on results

Connecting, Synthesizing and Integrating

- predicting from data or information
- proposing and explaining interpretations or conclusions
- developing theoretical explanations
- relating the data or information to laws, principles, models or theories identified in background information
- summarizing and communicating findings

Evaluating the Process or Outcomes

- identifying limitations of the data or information, and interpretations or conclusions, as a result of the experimental/research/project/design process or method used

The **STS connections** emphasized are:

- the central role of experimental evidence in the accumulation of knowledge, and the way in which proposed theories may be supported, modified or refuted
- the ways in which science advances technology and technology advances science

Course General Learner Expectations

Knowledge

- explain how solar energy and matter are converted by cellular photosynthetic processes to ATP or stored in organic compounds as potential chemical energy, and how this potential energy can be converted by cellular respiration to ATP; and describe the influence of oxygen, carbon dioxide, and environmental toxins on these processes

Skills

- perform investigations and tasks of their own and others' design that have a few variables and yield direct or indirect evidence; and provide explanations based upon scientific theories and concepts

- collect, verify and organize data into tables of their own design, and graphs and diagrams of others' design, using written and symbolic forms; and describe findings or relationships, using scientific vocabulary, notation, theories and models

STS Connections

- apply cause and effect reasoning to formulate simple relationships for a given instance in which scientific evidence shapes or refutes a theory; and describe the limitations of science and technology in answering all questions and solving all problems, using appropriate and relevant examples

Major Concept 2

Respiration releases potential energy from organic compounds.

Specific Learner Expectations

Knowledge

- explaining the role of oxygen in cellular respiration; e.g., anaerobic, aerobic

- summarizing and explaining the role of ATP in metabolism; e.g., synthesis, movement, active transport

Skills

- demonstrating that respiration causes oxidation and an exchange of gases

- using experimental methods to demonstrate, quantitatively, the oxygen consumption of an animal

STS Connections

- assessing the impact of research in cellular biochemistry on athletic training strategies

Introduction

From magazines, newspapers, etc., have students collect articles on a variety of strange diet strategies focusing on miracle weight loss without any apparent change in activity, or that focus on miracle chemicals/objects or food products. Use a class discussion to critically examine the products. The focus of the discussion should centre on what we know about the potential energy of food and how cells deal with this energy.

To balance the unlikely with the credible, students should also gather advertisements on products that have apparent scientific validity.

OR

Introduce an article or newspaper clipping on anabolic steroids and the athlete. Class discussion should revolve around cellular metabolic processes, the role of oxygen, ATP and the potential energy in food.

Experiential Exploration

Students design and carry out a calorimetry activity to demonstrate the potential energy in food.

OR

Students carry out a short intake/output study—daily intake of nutrients and energy expenditure.

Hypothesis-building

Based on previous learning and Science 10, Unit 2, Major Concept 1 and Major Concept 3, use a class discussion to help students develop an understanding that:

- the human respiratory system is anatomically and functionally designed to exchange gases with the environment
- biological oxidation involves the removal of hydrogen ions and their electrons.

Through a guided class discussion, help students to understand that:

- oxygen is the final hydrogen acceptor in cellular metabolic processes
- the ATP produced by the oxidative metabolic processes can be used by the cell or organism to do work
- oxygen consumption, by living organisms, is linked closely to the diet, activity and complexity of the organism
- various environmental factors affect the metabolism or organisms.

Guided discussion on individual metabolism, metabolism rates and oxygen consumption.

Elaboration

Perform an activity to measure and compare, qualitatively, thermal energy production by germinating mung bean seeds in an aerobic environment, and fermenting yeast cells in an anaerobic environment. Thermos bottles or student-designed insulated containers can be used for this activity.

Application

Students, in groups, could design charts/tables to show the energy available in various foods.

Students could prepare charts on the energy demands of various activities.

A comparison of the diets of advanced countries, primarily western, with the diets of people in less developed countries, in terms of types, amounts and energy content of food.

Significance

Class presentation or essay on:

- hibernation in animals
- long space travel
- cryogenics
- hypothermia.

A doctor or dietician as a guest speaker—perhaps with a focus on a psychological or physiological disorder.

Evaluation

- Tests, Quizzes and Exercises
  - knowledge quizzes on the key concepts of oxidative metabolism
  - draw/describe/explain some aspect of metabolism
  - worksheets for review

- Activities
  - written reports on each of the activities
  - observe students (checklists)
  - mark models/charts/assignments
  - mark single aspects of activities
  - peer evaluation

- Investigations
  - written reports on some aspect of diet/exercise
  - oral report on single concepts
  - critique on a news article
  - written report/essay on a topic related to metabolism
  - assess a specific skill

ENERGY AND MATTER EXCHANGE AND ECOSYSTEM TROPHIC LEVELS

This exemplar addresses the following ***Program*** and ***Course*** **General Learner Expectations** and the **Specific Learner Expectations** from the Biology 20 course of studies.

Program General Learner Expectations

The **themes** emphasized are *diversity, energy, matter* and *systems.*

The aspects of the **skills framework** emphasized are:

Initiating and Planning

- identifying and clearly stating the problem or issue to be investigated
- differentiating between relevant and irrelevant data or information according to safety regulations; e.g., Workplace Hazardous Materials Information System (WHMIS), and environmental considerations
- assembling and recording background information
- formulating questions, hypotheses and/or predictions to guide research
- preparing required observation charts or diagrams

Collecting and Recording

- accurately observing, gathering and recording data or information according to safety regulations; e.g., Workplace Hazardous Materials Information System (WHMIS), and environmental considerations

Organizing and Communicating

- organizing and presenting data (themes, groups, tables, graphs, flow charts and Venn diagrams) in a concise and effective form
- communicating findings of investigations in a clearly written report

Analyzing

- identifying assumptions, attributes, biases, claims or reasons
- identifying main ideas

Connecting, Synthesizing and Integrating

- predicting from data or information
- identifying alternatives for consideration
- proposing and explaining interpretations or conclusions
- proposing solutions to a problem being investigated
- summarizing and communicating findings

Evaluating the Process or Outcomes

- considering consequences and perspectives

The **STS connections** emphasized are:

- the central role of experimental evidence in the accumulation of knowledge, and the way in which proposed theories may be supported, modified or refuted
- the ability and responsibility of society, through science and technology, to protect the environment and use natural resources judiciously to ensure quality of life for future generations

Course General Learner Expectations

Knowledge

- explain how equilibrium in the biosphere is maintained by the flow of energy from the Sun through the chemical processes of photosynthesis and cellular respiration, and by the cycling of matter through the biogeochemical cycles; and describe the influence of human activities on the equilibrium of energy and matter exchange and atmospheric composition

- differentiate ecosystems on the basis of the energy and matter exchange of their biotic and abiotic components, by performing field studies on terrestrial and aquatic ecosystem; and explain, quantitatively and qualitatively, the trophic structure of ecosystems, using models, such as food webs, chains and pyramids

Skills

- perform investigations and tasks of their own and others' design that have a few variables and yield direct or indirect evidence; and provide explanations based upon scientific theories and concepts

- collect, verify and organize data into tables of their own design, and graphs and diagrams of others' design, using written and symbolic forms; and describe findings or relationships, using scientific vocabulary, notation, theories and models

STS Connections

- apply cause and effect reasoning to formulate simple relationships for a given instance in which scientific evidence shapes or refutes a theory; and describe the limitations of science and technology in answering all questions and solving all problems, using appropriate and relevant examples

- explain for a given instance how science and technology are influenced and supported by society, and the responsibility of society, through biology and technology, to protect the environment and use natural resources wisely

Major Concept 2

Ecosystems have characteristic structures determined by their energy and matter exchange.

Specific Learner Expectations

Knowledge

- explaining, quantitatively, the structure of ecosystem trophic levels, using models, such as food chains and webs

Skills

- collecting information and building a model depicting the food web of a chosen ecosystem

STS Connections

- discussing the impact of the draining of wetlands for "reclamation" and society's responsibility to use natural resources judiciously
- analyzing the interrelationship between the introduction of heavy metals into the environment and matter exchange in natural food webs/chains, and the impact of this on quality of life.

Introduction

Discussion of the Chernobyl disaster and its implications in the human and natural food chain.

OR

Students, individually or in groups, could research the major contaminants of game fish and identify the sources and movement through the food chain of the contaminants.

Experiential Exploration

A feeding investigation involving the mechanisms of feeding and the relationship between two members of a food chain (yeast/paramecium/hydra).

Hypothesis-building

Based on previous learning and Science 10, Unit 2, Major Concept 3 and Major Concept 4, use a class discussion to help students develop an understanding that:

- all food relationships in living organisms are based on producers
- living systems can concentrate environmental contaminants
- all living organisms belong to a complex ecological system of relationships.

Through a guided class discussion, help students come to an understanding that:

- the movement of energy and matter in living systems can be demonstrated by models, such as food webs, food chains or pyramids (of energy, matter, numbers)
- the activities of humans can alter or destroy nutrient relationships in natural systems
- some groups of organisms are particularly sensitive to environmental contaminants due to their trophic position in the environment.

Elaboration

Explain how biologically active chemicals from isolated and remote pulp and paper mills can accumulate in the tissues of human organisms not directly associated with the operation of these facilities by researching and designing a model demonstrating the relationship of the human organism to natural food chains in our environment.

Application

Research, in groups, the individual components of the food web in two or three diverse ecosystems and then have the class assemble the whole picture. This could involve presentations and an actual model of the food web.

Study the components of common household products, and identify specific components that may become concentrated in living systems; e.g., pesticides, heavy metals, organic compounds.

Through a class discussion, have students apply their knowledge of nutrient cycling from the previous unit to the effect on living systems of current personal and industrial disposal practices.

Significance

Research, individually or in groups, a specific human disorder that can be linked to an environmental contaminant; e.g., Minimatta disease, mercury, arsenic, lead poisoning, and what steps, if any, have been made to address the problem.

Select a single industry and explain, in class presentations, how operation of this industry could, or does, introduce contaminants into living systems.

Evaluation

- Tests, Quizzes and Exercises
  - knowledge quizzes on trophic levels, food chains/webs
  - draw/describe/explain trophic level structure
  - have students explain some aspect, oral/written, of ecosystem structure as it relates to matter and energy
  - checklists or some score mechanism for student understanding
  - worksheets for review

- Activities
  - written reports on each of the activities
  - observe students (checklists)
  - mark models/charts/assignments
  - mark debate on human impact on ecosystem structure
  - mark what students build/assemble or bring into class
  - peer evaluation

- Investigations
  - written reports on common household toxins
  - oral report on a human disorder linked to an environmental contaminant
  - critique on a news article relating to the concepts covered
  - written report/essay
  - assess a skill

THE PROTECTIVE ROLE OF THE SKIN AND BLOOD

This exemplar addresses the following ***Program*** and ***Course*** **General Learner Expectations** and the **Specific Learner Expectations** from the Biology 20 course of studies.

Program General Learner Expectations

The **themes** emphasized are *energy, equilibrium, matter* and *systems.*

The aspects of the **skills framework** emphasized are:

Initiating and Planning

- identifying and clearly stating the problem or issue to be investigated
- assembling and recording background information
- identifying materials and apparatus required
- preparing required observation charts or diagrams

Collecting and Recording

- carrying out the procedure and modifying, if necessary
- organizing and correctly using apparatus and materials to collect reliable experimental data
- accurately observing, gathering and recording data or information according to safety regulations; e.g., Workplace Hazardous Materials Information System (WHMIS), and environmental considerations

Organizing and Communicating

- organizing and presenting data (themes, groups, tables, graphs, flow charts and Venn diagrams) in a concise and effective form
- expressing measured and calculated quantities to the appropriate number of significant digits, using SI notation for all quantities

Analyzing

- identifying and discussing sources of error and their affect on results
- identifying main ideas

Connecting, Synthesizing and Integrating

- predicting from data or information
- identifying further problems or issues to be investigated
- proposing and explaining interpretations or conclusions
- summarizing and communicating findings

Evaluating the Process or Outcomes

- considering consequences and perspectives

The **STS connections** emphasized are:

- the central role of experimental evidence in the accumulation of knowledge, and the way in which proposed theories may be supported, modified or refuted
- the functioning of product or processes based on scientific principles
- the use of technology to solve practical problems
- the influence of the needs, interests and financial support of society on scientific and technological research

Course General Learner Expectations

Knowledge

- explain the role of structure, function and regulatory mechanisms of the digestive, respiratory, excretory and circulatory systems in matter and energy exchange; and describe blood cellular components, and explain the role of the immune system in protecting the human organism and maintaining internal equilibrium

Skills

- perform investigations and tasks of their own and others' design that have a few variables and yield direct or indirect evidence; and provide explanations based upon scientific theories and concepts

- collect, verify and organize data into tables of their own design, and graphs and diagrams of others' design, using written and symbolic forms; and describe findings or relationships, using scientific vocabulary, notation, theories and models

STS Connections

- apply cause and effect reasoning to formulate simple relationships for a given instance in which scientific evidence shapes or refutes a theory; and describe the limitations of science and technology in answering all questions and solving all problems, using appropriate and relevant examples

- describe and explain the design and function of technological solutions to practical problems, using scientific principles; and relate the ways in which biology and technology advance one another, using appropriate and relevant examples

Major Concept 3

The human organism's circulatory system transports matter and energy to maintain equilibrium among the body systems as well as between the organism and its external environment.

Specific Learner Expectations

Knowledge

- describing the main components of blood and their role in transport and resisting the influence of pathogens; e.g., erythrocytes, leucocytes, platelets, plasma.

Skills

- observing blood flow in the capillaries of a living organism
- performing, quantitatively, experiments that demonstrate human venous pressure
- measuring and interpreting their own blood pressure and investigating the role of exercise in influencing blood pressure
- using a microscope to examine prepared slides of human blood to observe the morphology and relative abundance of the cellular components of the blood

STS Connections

- researching experimental evidence on disruptions to human circulatory equilibrium caused by severe burns

- evaluating the needs, interest and financial support society has on preventing the spread of disease-causing organisms, like Staphylococcus, smallpox virus and the human immunodeficiency virus (HIV)

Introduction

Burns have a very traumatic effect on humans. Although many body systems are affected by severe burns, the integumentary and circulatory systems are of prime importance. A guest speaker, such as a health care professional from a burn unit, or a burn victim, would be appropriate for two reasons: 1) they have first-hand experience on the importance of the skin and immune systems; and 2) there is a very strong emotional issue surrounding fire, burn victims and disfigurement.

Experiential Exploration

Students can design and carry out an activity to demonstrate blood flow, using liquid crystal discs.

An activity to identify, draw and research the roles of the various cellular blood components that are involved in pathogen control.

Hypothesis-building

Based on previous learning and Science 10, Unit 2, Major Concept 3 and Major Concept 4, use a class discussion to help students develop an understanding of:

- anatomy and physiology of the major components of the peripheral circulatory system
- anatomy and physiology of the integumentary system.

Through a directed class discussion, help students come to the understanding that:

- the blood has cellular and noncellular components that are responsible for protection against pathogens
- the human immune system responds in a very specific manner when it is confronted by foreign antigens
- organ transplants, including skin grafts, require close tissue matches or chemicals that suppress the body's natural immune response
- the immune system can turn against its own tissues because of various disorders
- the immune system is not always able to recognize pathogens.

Elaboration

Observe, identify and accurately draw the principle features of human skin, using prepared slides of human tissue and identifying the cells and tissues involved in partial and full thickness burns; and the role of these cells and tissues in the maintenance of system equilibrium. Where possible, students should compare undamaged and burn-damaged human skin tissue, using prepared slides of damaged tissue from biological supply companies or research pathology laboratories.

Application

Activities involving measuring, recording and comparing arterial and venous blood pressures.

Activities that demonstrate antibody/antigen reactions. As blood products are not to be used in the classroom, there are a number of vegetable extract simulations that can be used.

Term paper, with the focus on the nature of science, on a specific disease wherein the cure or control of the disease involves the immune system.

Significance

Class discussion on:

- HIV
- skin grafts
- auto-immune diseases
- organ transplants.

Risk analysis on blood transfusions.

Research into nontissue substitutes for skin, blood.

Evaluation

- Tests, Quizzes and Exercises
    - knowledge quizzes, blood components and flow
    - draw/describe/explain the cellular components of blood
    - have students explain some aspect, oral/written, of the role of the skin and blood in resisting pathogens
    - worksheets for review

- Activities
    - written reports on each of the activities
    - observe students (checklists)
    - mark models/charts/assignments
    - debate: organ transplants, AIDS, organ donation
    - mark what students build/assemble or bring into class
    - peer evaluation

- Investigations
    - written reports on a research scientist involved in human pathogens
    - oral report on some pathogen affecting humans
    - critique on a news article related to the concept
    - written report/essay
    - assess a skill

RESOURCES

RESOURCES OVERVIEW

by Desiree Hackman and Pamela Shipstone

The following is a list of resources useful for implementing the Biology 20–30 program. This resource list is divided into the following sections:

- Biology 20 Major Concepts with Resource Listings (by Unit)
- Biology 30 Major Concepts with Resource Listings (by Unit)
- Biology 20–30 Basic Student Learning Resources
- Biology 20–30 Authorized Student Support/Teaching Resources
- Other Learning Resources: General
  - Laboratory Interfaces
  - Software
  - Videodiscs
  - Teacher Background
- Other Learning Resources: Biology 20 (by Unit)
- Other Learning Resources: Biology 30 (by Unit)
- Distributor Addresses (alphabetical)

Basic student learning resources are those student learning resources authorized by Alberta Education as the most appropriate for addressing the majority of learner expectations of the course(s), substantial components of the course(s), or the most appropriate for meeting general learner expectations across two or more grade levels, subject areas or programs as outlined in provincial programs of study. These may include any resource format, such as print, computer software, manipulatives or video.

Support student learning resources are those student learning resources authorized by Alberta Education to assist in addressing some of the learner expectations of course(s) or components of course(s); or assist in meeting the learner expectations across two or more grade levels, subject areas or programs as outlined in the provincial programs of study. They may include any resource format, such as print, computer software, manipulatives or video.

Authorized teaching resources are those teaching resources produced externally to Alberta Education (for example, by publishers) that have been reviewed by Alberta Education, found to meet the criteria of review and to be the best available resources to support the implementation of programs of study and courses, and the attainment of the goals of education; they have been authorized by the Minister. Teaching resources produced as service documents by Alberta Education, such as the *STS Science Education: Unifying the Goals of Science Education*, 1990 monograph, and diagnostic programs, are authorized by definition.

Other learning resources are those learning resources identified by Alberta Education as useful for teachers in the implementation of a course(s) or program(s) of studies, but which have not undergone review procedures by Alberta Education. Alberta Education does not accept responsibility for use of these resources with students. It is the responsibility of the teacher to determine their suitability and application.

When searching for resources to support the science program you may want to check:

- Other departments within your school. Often, resources are useful for ideas in more than one subject area. For example, Junior High Science, Environmental and Outdoor Education (EOE), Social Studies, Career and Life Management (CALM), or English.
- School library for print or nonprint resources.
- ACCESS Network for many authorized teaching and support video resources.
- LRDC for most authorized teaching and support print resources and some nonprint resources.
- Government and nongovernment agencies for print and nonprint educational materials and/or background information.
- Distributor for print and nonprint resources.

Basic student learning resources are available through the Learning Resources Distributing Centre (LRDC). A *Buyers Guide* is also available.

Learning Resources Distributing Centre
12360 - 142 Street
Edmonton, Alberta
T5L 4X9
Telephone (403) 427-2767

Note: The information included is the most recent available at the time of document preparation. Prices of resources are as provided by distributors, May 1993. Check with distributor for current rates.

UNIT 1: THE BIOSPHERE

A – Authorized Section
O – Other Section, Biology 20:
• by Unit
★ – Nonprint
● – Print

1. The biosphere is maintained by a constant flow of energy.

O●Biosphere (The): Science Now Series
A★Effects of Water Pollution (The): The Fragile Planet Series
O★Energy: Science in Focus Series
O●Environment: Pathways Through Science Series
O★Fate of the Earth (Part 1): Geochemical Cycles: Planet Earth Series
O●Protection of Farm-stored Grains and Oilseeds from Insects, Mites and Molds
A★Seeing the Light: Photosynthesis Series

2. The cycling of matter through the biosphere perpetuates its steady state equilibrium.

O★Can Polar Bears Tread Water?
A★Comfort Blanket (The): Planet Under Pressure Series
O●Environment: Pathways Through Science Series
O★Global Warming: Climate and Man Series
O★Greenhouse
O★Greenhouse Effect (The): Climate and Man Series
O★Habitat Turned Hothouse (A): Icewalk Series
O●Impacts of Global Warming (The)
A★Living Soil: Planet Under Pressure Series
O★Once and Future Planet
O●Protection of Farm-stored Grains and Oilseeds from Insects, Mites and Molds
O●Recognizing Herbicide Action and Injury
A★Seeing the Light: Photosynthesis Series
A★Sharing Carbon: Planet Under Pressure Series

3. The balance of energy and matter exchange in the biosphere, as an open system, maintains its steady state equilibrium.

O★Can Polar Bears Tread Water?
O●Climate Change Digest: Exploring the Implications of Climate Change for the Boreal Forest and Forestry Economics of Western Canada
O★Climate Puzzle (The): Climates—Past, Present and Future: Planet Earth Series
A★Effects of Water Pollution (The): The Fragile Planet Series
O●Environment: Pathways Through Science Series
O★Fateful Balance (The)
O★Gaia: Goddess of the Earth
O★Global Warming: Climate and Man Series
O★Greenhouse
O★Greenhouse Effect (The)
O★Greenhouse Effect (The): Climate and Man Series
O★Greenhouse Effect (The): The Global Environment Series
O★Horizon: The Greenhouse Effect
O●Impacts of Global Warming (The)
O★Once and Future Planet
O★Only One Atmosphere: Race to Save the Planet Series
O★Only One Earth
A★Oxygen Partnership: Planet Under Pressure Series
A★Ozone: Planet Under Pressure Series
O●Ozone and UV Bulletins
O★Vista: The Greenhouse Effect
A★Winds of Change: Planet Under Pressure Series

UNIT 2: ENERGY FLOWS AND CELLULAR MATTER

A - Authorized Section
O - Other Section, Biology 20:
  • by Unit
★ - Nonprint
● - Print

1. Photosynthesis stores energy in organic compounds.

O★Energy: Science in Focus Series
O●Environment: Pathways Through Science Series
O★Experiments in Photosynthesis
O●Lawn Herbicides
O★Light and Energy: Science Show Series
O●Pesticide Education Program
A★Seeing the Light: Photosynthesis Series

2. Respiration releases potential energy from organic compounds.

A★Acid Assault (The): Planet Under Pressure Series
A★Cell and Energy (The): Cellular Respiration Series
A★Glycolysis 1: Cellular Respiration Series
O●Lawn Herbicides
O★Metabolism: The Fire of Life
O●Pesticide Education Program

UNIT 3: ENERGY AND MATTER EXCHANGE IN ECOSYSTEMS

A – Authorized Section
O – Other Section, Biology 20:
• by Unit
★ – Nonprint
● – Print

1. The biosphere is composed of a diversity of biomes, each with distinctive biotic and abiotic factors.

O●Alberta: A Natural History
A●★Aquatic Invertebrate Monitoring Program
O★Biomes: Aspects of Ecology Series
O★Biomes: Coniferous Forest
O★Biomes: Desert
O★Biomes: Grassland
O★Biomes: Introduction
O★Biomes: Tropical Rain Forest
O★Biomes: Tundra
O●Biosphere (The): Science Now Series
O★Blue Collar Bugs (The): The Life Revolution Series
O★Boreal Forest (The)
O★Carmanah Forever: Parks and Wilderness Package, Module 1
O★Climate for Growth (A): Bow Summit Edukit
O★Ecology and Conservation: Parks and Wilderness Package, Module 1
A●Ecology Studies of Lakes in Alberta: Water Literacy Series
O★Forests
O★Fragile Soil (The): Earth Series
A●Natural Regions of Alberta—Poster Series
O★New Leaf (A): Real Sustainability for the Boreal Forest
O★Patterns—A Mountain Patchwork: Bow Summit Edukit
O★Shores of Life (The)
A●Water Quality Questions: The Nature and Importance of Water Quality Variables in Alberta
A★Water, Water Everywhere: Planet Under Pressure Series
O●Weeds of the Prairie

2. Ecosystems have characteristic structures determined by their energy and matter exchange.

A★Acid Assault (The): Planet Under Pressure Series
A●★Aquatic Invertebrate Monitoring Program
O★Boreal Forest (The)
O★Carmanah Forever: Parks and Wilderness Package, Module 1
O★Circles and Cycles: Aspects of Ecology Series
O★Climate for Growth (A): Bow Summit Edukit
O★Ecology and Conservation: Parks and Wilderness Package, Module 1
O★Ecosystems: Aspects of Ecology Series
O★Ecosystems of the Great Land Series
O★Energy and the Food Web: Science in Focus Series
O★Life in the Balance: The Interdependence of Species and Ecosystems: The Infinite Voyage Series
O●Microcosmos Coloring Book (The)
O★Micro-organisms (The): Aspects of Ecology Series
A●Natural Regions of Alberta—Poster Series
O★New Leaf (A): Real Sustainability for the Boreal Forest
O★Patterns—A Mountain Patchwork: Bow Summit Edukit
O★PCBs in the Food Chain
O★Shores of Life (The)

3. Populations are basic components of ecosystem structure.

O★Adaptations—A Struggle for Survival: Bow Summit Edukit
A●★Aquatic Invertebrate Monitoring Program
O★Darwin, Naturally: Organic Evolution Series
O★Form and Function of Fossils: The Earth Explored Series
O★In the Beginning: Organic Evolution Series
A★Natural Selection
O★Origins of Change: DNA and the Evidence for Evolution: The Evolution Series
O★Populations: Aspects of Ecology Series
O●Science, Technology and Society

UNIT 4: ENERGY AND MATTER EXCHANGE BY THE HUMAN ORGANISM

A - Authorized Section
O - Other Section, Biology 20:
- by Unit

★ - Nonprint
● - Print

1. The human organism's digestive and respiratory systems exchange energy and matter with the environment.

O●Bodywise: Pathways Through Science Series
O★Coping with Change: Homeostasis Series
O★Digestion: Chemical Changes
A★Digestive System (The): The Human Body Series
O★External Respiration
O★Human Digestive System
O★Transplant Immunology: Women in Science Series
O●What Everyone Should Know About Food Safety

2. The human organism's excretory system exchanges energy and matter with the environment.

O●Bodywise: Pathways Through Science Series
O★Coping with Change: Homeostasis Series
O★Excretory System: The Human Body Series
O★Osmoregulation: Homeostasis Series

3. The human organism's circulatory system transports energy and matter to maintain equilibrium among the body systems as well as between the organism and its external environment.

A●AIDS: A Teacher Resource Package
A●AIDS: What Every Responsible Canadian Should Know
O★Bodyguard Dreams and Realities: Mind and Body Series
O●Bodywise: Pathways Through Science Series
O★Circulation of the Blood (Marlin Motion Pictures Ltd.)
O★Circulation of the Blood (Canadian Learning Company)
O★Circulatory and Respiratory Systems: The Human Body Series
O★Controlling Pain: Science Show Series
O★Coping with Change: Homeostasis Series
O★Education About AIDS for Secondary Teachers
O★Immune System (The): Science Show Series
A★Immune System (The): Your Magic Doctor
O★Life Under Pressure
O★Membranes and Transport: Biology Form and Function Series
O★Michael Brown and Joseph Goldstein: Nobel Prize Series
O★Osmoregulation: Homeostasis Series
O★Our Immune System: The Human Body Series
O●River of Life: A Resource Unit on Blood, Circulation and Lymphatics
O●Source Book for Health Education Materials and Community Programs
O★Susumu Tonegawa: Keys to the Immune System: Nobel Prize Series
O★Transplant Immunology: Women in Science Series

UNIT 1: SYSTEMS REGULATING CHANGE IN HUMAN ORGANISMS

A – Authorized Section
O – Other Section, Biology 30:
  • by Unit
★ – Nonprint
● – Print

1. The human organism regulates physiological processes, using electrochemical control systems.

O★Nervous System: The Human Body Series
O★Vision and Movement: The Brain Series

2. The human organism maintains homeostasis through the use of complex chemical control systems.

O★Blood Sugar Regulation and Diabetes: Biology Form and Function Series
O★Chemistry of Life: Hormones and the Endocrine System
O★Endocrine System: The Human Body Series
O★Messengers: The Living Body: The Circulatory System Series

UNIT 2: REPRODUCTION AND DEVELOPMENT

A - Authorized Section
O - Other Section, Biology 30:
 • by Unit
★ - Nonprint
● - Print

1. Humans and other organisms have complex reproductive systems that ensure the survival of the species.

O★Bodyguard: Sexually Transmitted Diseases and AIDS: Bodyguard Series
O★Million Teenagers (A), Fifth Edition
A★Reproductive System: The Human Body Series
O●Science, Technology and Society

2. Reproductive success of organisms is regulated by chemical control systems.

O★Miracle of Life (The): Interactive NOVA

3. Cell differentiation and organism development are regulated by a combination of genetic, endocrine and environmental influences.

O★Miracle of Life (The): Interactive NOVA
A★Reproductive System: The Human Body Series
O●Science, Technology and Society

UNIT 3: CELLS, CHROMOSOMES AND DNA

A - Authorized Section
O - Other Section, Biology 30:
• by Unit
★ - Nonprint
● - Print

1. Cells divide to increase in number but must reduce their chromosome number before combining at fertilization.

O★All in the Family: The Life Revolution Series
O★Amniocentesis for Prenatal Testing
O★Cancer: A Genetic Disease
O★Gene Machine (The)
O★Genes and Hereditary Disorders
O★Genetic and Plant Improvements
O★Great Gene Robbery (The): Turning the Tide Series
O★Meiosis: The Key to Genetic Diversity (Canadian Learning Company)
O★Meiosis: The Key to Genetic Diversity (Human Relations Media)
O★Mitosis and Genetics: The Cell Series
O★Muscular Dystrophy: Race for the Gene
O★Wheat: A New Breed: Genetics Series

2. Genetic characters are handed down by simple rules.

A★Barbara McClintock: Pioneer of Modern Genetics: Nobel Prize Series
O★Delicate Balance: Human Health Through Biotechnology
O★Genetic Code (The): The World of Chemistry Series
O★Genetic Engineering and Protein Synthesis
O★Genetics: Science Show Series
O★Geometry of Life (The): Exploring DNA and the Double Helix: The Infinite Voyage Series
O★Meiotic Mix (The): Organic Evolution Series
O★Mutation and All That: Organic Evolution Series
O★Nucleus (The): Cell Biology Series
O★Of the Earth: Agriculture and the New Biology
O★Pandora's Box: The Life Revolution Series
O★Patterns of Diversity: Genetics Series
O★Projecting Visions: Developmental Biology Series
O★Rare Breeds: The Nature of Things Series
O●Science, Technology and Society
O★Secrets of Life: The Life Revolution Series
O★Translating the Code: Protein Synthesis (Canadian Learning Company)
O★Translating the Code: Protein Synthesis (Human Relations Media)
O★Web of Life (The)

3. Classical genetics can be explained at a molecular level.

O★Biochemistry: The World of Chemistry Series
A★Protein Synthesis Series
O★Translating the Code: Protein Synthesis (Canadian Learning Company)
O★Translating the Code: Protein Synthesis (Human Relations Media)

UNIT 4: CHANGE IN POPULATIONS AND COMMUNITIES

A - Authorized Section
O - Other Section, Biology 30:
  ⋆ by Unit
★ - Nonprint
● - Print

1. Communities are made up of populations that consist of pools of genes from the individuals of a species.

O★Factoring in Mendel: Organic Evolution Series
O★Population Picture (The): Organic Evolution Series

2. Individuals of populations interact with each other and members of other populations.

A★Ecology Series
O★Remnants of Eden: Race to Save the Planet Series

3. Population change over time can be expressed in quantitative terms.

A★Ecology Series
O★Factoring in Mendel: Organic Evolution Series
A★Natural Selection
O★Population Picture (The): Organic Evolution Series

Basic Student Learning Resources

Biology 20 and Biology 30

Biology Directions, 1993

Format	Text	ISBN 0471795127
Annotation	Examines the interaction among science, technology and society following the guidelines outlined in the Biology 20–30 Program of Studies. Each unit of *Biology Directions* opens with a discussion of how major themes in the course—change, diversity, energy, equilibrium, matter and systems—are connected within each unit. Review questions, extension exercises and science-technology-society connections are included at the end of each chapter.	
Price	$58.35	
Author	Don Galbraith et al.	
Publisher	John Wiley & Sons Canada Ltd.	
Distributor	LRDC	105644

Life Science: Principles of Biology: The Living Textbook Series, 1988

Format	Videodisc	
Annotation	A three-videodisc set, this program contains more than 2700 slides, 150 diagrams and 163 movie clips covering molecular, cell, plant, animal and human biology. Included are a 650-term glossary and 1000 of *Oxford Scientific* photos. Movie clips cover detailed biological processes, such as: cell biology, from protein synthesis to living cells; reproduction, from spermatogenesis to frog development; human biology, covering a whole range of systems and their functions; protist biology; fungi, from bread mould to zoospore release; plant reproduction and life cycles; invertebrates; and vertebrate biology, including behaviour and interaction. Molecular, Cell and Human Biology (sides 1 and 2) have curricular fit to Science 10, Biology 20–30 and Science 20–30. Plant and animal biology (sides 3, 4, 7 and 8) offer a survey of life science. Mechanisms of stability and change (sides 7 and 8) have curriculum fit to Science 10 and Science 20–30 as well. Teachers should be aware that some frames contain detailed dissections of vertebrates.	
Price	$995	
Distributor	LRDC	240705

Nelson Biology, 1993

Format	Text	ISBN 0176038604
Annotation	Examines the interaction among science, technology and society as outlined by the Biology 20–30 Program of Studies. A number of science-related social issues are described throughout the text, presenting an opportunity for class debates. Review questions and laboratory experiments are included at the end of each chapter.	
Price	$53.55	
Author	Bob Ritter and Bruce Drysdale	
Publisher	Nelson Canada	
Distributor	LRDC	105652

Authorized Student Support/Teaching Resources

AIDS: A Teacher Resource Package, 1987 **Biology 20, Unit 4**

Format	Print	ISBN 0889961360

Annotation (*Authorized Teaching Resource* for *CALM 20*)

This resource is divided into eight lessons:

1. Introduction to AIDS
2. Biology of AIDS
3. Disease and Epidemics
4. Sex and Consequences
5. Decision Making
6. Death and Disease
7. AIDS and The Community
8. AIDS: The Future and the World.

Each lesson includes blackline masters and answer keys for exercises. It also offers suggestions for further study, resource lists and test questions for evaluation purposes.

Price	$16	
Author	J. H. Golick and James D. Grieg	
Distributor	LRDC	129412

AIDS: What Every Responsible Canadian Should Know, 1987 **Biology 20, Unit 4**

Format Print

Annotation (*Authorized Teaching Resource* for *CALM 20*)

Not intended for student use. This publication offers a thorough explanation about AIDS through the following topics: testing, safe sex, government, women, parents and teachers, workplace, health care worker and the citizen. The information is presented in a question/answer format. It provides a quick reference for teachers and administrators.

Price	$1.75	
Author	J. Greig	
Distributor	LRDC	129280

Aquatic Invertebrate Monitoring Program, 1991 **Biology 20**

Format	Kit	
Annotation	*(Authorized Teaching Resource)* The kit includes a teacher's manual and video. The video discusses Project AIM, methods and techniques and aquatic invertebrates.	
Price	$85 (components can be purchased separately)	
Distributor	FEESA: An Environmental Education Society	

Aquatic Invertebrates of Alberta: An Illustrated Guide, 1991 **Biology 20**

Format	Print	ISBN 0888642342
Annotation	*(Authorized Teaching Resource)* A great diversity of invertebrates is living beneath the surface of Alberta's lakes and streams. This publication complements existing field guides to organisms in Alberta. All major groups of aquatic invertebrates are covered. Each taxon chapter has a section on collecting, collecting sites, preserving and biology of the group. Coloured photographs, pictorial keys and 114 whole-specimen drawings complement the text. A methods section deals with suggestions on collecting, identifying and preserving invertebrates and includes a short segment on classification and taxonomical units. Copies of this book were distributed to most high school libraries.	
Price	$50.05	
Author	Hugh F. Clifford	
Distributor	LRDC	240193

Asimov's Chronology of Science and Discovery, 1989 **Biology 20–30**

Format	Print	ISBN 0060156120
Annotation	*(Authorized Teaching Resource)* From 4 000 000 BCE to the present, the significant events in astronomy, exploration, biology, physics, chemistry and mathematics are described. Asimov illustrates how scientific, cultural, social and political events affected each other. Discoveries and inventions are categorized by year of discovery against a backdrop of world history, and show how science influenced the world and how the world has responded to scientific advances.	
Price	$28.55	
Author	Isaac Asimov	
Distributor	LRDC	261412

Athabasca (The): A Case Study: Senior High Science Video Series, 1990

Biology 20

Format	Video	
Annotation	(*Authorized Student Support*) This program examines the impact that proposed pulp and paper mills would have on the ecology of the Athabasca River, with a focus on a variety of viewpoints.	
Price	Contact distributor	
Distributor	ACCESS Network	BPN 302207

Atlas of Environmental Issues, 1989

Biology 20

Format	Print	ISBN 081602023X
Annotation	(*Authorized Student Support* for *Environmental and Outdoor Education*) Describes and explains major environmental issues of today's world, including soil erosion, deforestation, mechanized agriculture, oil pollution of oceans, acid rain, overfishing and nuclear power. Excellent graphics.	
Price	$22.88	
Author	Nick Middleton	
Distributor	Facts On File	

Barbara McClintock: Pioneer of Modern Genetics: Nobel Prize Series, 1990

Biology 30

Format	Video (20 minutes)	
Annotation	(*Authorized Student Support*) The program consists of a 20-minute video, and a teacher resource book, including an interview with the laureate, a student notebook with an overview of her life and her research into genetic coding. Barbara McClintock won the 1993 Nobel Prize in physiology/medicine. Her research discoveries were made over a thirty-year period. The video also describes the work that led to McClintock's discovery about the arrangement of genes in a chromosome.	
Price	$70.30	
Distributor	LRDC	240797

Biology: Discovering Life, 1991 Biology 20–30

Format Print ISBN 0669120081

Annotation *(Authorized Student Support)*

Concepts are illustrated by the use of diagrams, graphics and photographs. Teachers should note that there is a section on contraception in the unit on reproduction. While this topic is covered in the Biology 30 curriculum there should be an awareness of its presence in this text.

Price $66.05

Author Joseph S. Levine and Kenneth R. Miller

Distributor LRDC 240234

Biology Directions: Teacher's Resource Guide, 1993 Biology 20–30

Format Print ISBN 0471795119

Annotation *(Authorized Teaching Resource)*

Summary of features:

1. unit objectives
2. chapters at a glance
3. suggested teaching/learning strategies
4. activity integration: activities are discussed and analysis and interpretation questions are outlined
5. correlation with videodisc: *Life Science: Principles of Biology: The Living Textbook Series* at frequent intervals in the guide; bar codes for appropriate image series and film clips
6. answers to questions: answers to review questions, extensions and science–technology–society connections
7. resource materials: audio-visuals, books, periodicals and software lists
8. laboratory materials: list of all equipment required for a class of 30 students
9. a look at a cell: includes information on how stereoscopic images are made.

Appendix: How to View Stereo Images: explains how to set up two projectors to show the stereo slides. In the pocket of the teacher resource guide are two pairs of special glasses. One pair is needed to view the stereo print images and the other pair is used to view the stereo slides when they are projected onto a screen.

Price $134

Distributor LRDC 239055

Biology Directions Manual: Investigations and Issues, 1993 **Biology 20–30**

Format	Print	ISBN 0471795100

Annotation *(Authorized Student Support)*

This manual accompanies the textbook *Biology Directions*. The following features of the manual address the development of knowledge, skills and attitudes for the Biology 20–30 program:

1. safety guidelines
2. background information for each activity
3. experimental design section gives overview of the problem-solving process
4. the material section includes a list of supplies needed for activities
5. science-technology-society connections investigations
6. appendices for measurement, accuracy, significant digits and the use of graphs.

Price	$20.40	
Author	Bill MacLean et al.	
Distributor	LRDC	238742

Career Connections Series, 1993 **Biology 20–30**

Format Print

Annotation *(Authorized Student Support)*

Summary: This series outlines the educational background needed to qualify for different careers in a variety of areas. Personal profiles and comments from individuals are featured.

Great Careers for People Interested in How Things Work
ISBN 1895579082
Author: Peter Richardson and Bob Richardson

Describes careers such as: inventor, chemical research analyst, automotives mechanic.

Great Careers for People Interested in the Human Body
ISBN 1895579066
Author: Lois Edwards

Describes careers such as: family physician, respiratory technologist, community health nurse.

Great Careers for People Who Like Being Outdoors
ISBN 1895579104
Author: Helen Mason

Describes careers such as: park naturalist, practical forester, farmer.

Great Careers for People Concerned About the Environment
ISBN 189557904X
Author: Lesley Grant

Describes careers such as: environmental chemist, lawyer, health specialist.

Great Careers for People Interested in Math and Computers
ISBN 1895579023
Author: Peter Richardson and Bob Richardson

Describes careers such as: mathematics consultant, video games programmer, audio engineer.

Great Careers for People Interested in Living Things
ISBN 1895579007
Author: Julie Czerneda

Describes careers such as: plant scientist, museum biologist, equestrian coach.

Price	Contact distributor
Distributor	LRDC

Cellular Respiration Series, 1988 **Biology 20**

Format	Six, 10-minute videos
Annotation	(*Authorized Student Support*)

Summary: Computer animation is used to illustrate some facets of cellular respiration. The series examines the essential fuels and machinery used by living forms to sustain themselves.

Cell and Energy (The) VC324201
The cell's energy molecule, glucose, is examined and the process of extracting energy from glucose in the form of adenosinetriphosphate (ATP) in mitochondria is discussed.

Glycolysis 1 VC324202
Begins with the discovery of the role played by the cell cytoplasm during cellular respiration. The sequential breakdown of glucose through the process of glycolysis that leads to the production ATP molecules is illustrated by computer animation.

Glycolysis 2 VC324203
The second half of the glycolysis process introduces the intermediate molecule nicotinamide adenine dinucleotide (reduced) (NADH). The glycolytic breakdown of glucose continues, ending with the production of the molecule pyruvic acid. Also, a look at how simple life forms produce alcohol.

Krebs Cycle (The) VC324204
The Krebs cycle is illustrated in the mitochondria, using three-dimensional computer animation. The cyclical metabolism of pyruvic acid and the subsequent generation of NADH inside the cell mitochondrion are shown.

Oxidative Phosphorylation VC324205
The process of oxidative phosphorylation across the inner membrane of the mitochondria is shown to depend on the creation of a hydrogen gradient that, in turn, synthesizes ATP molecules. The total number of ATPs produced from a single glucose molecule through the combined processes of glycolysis, the Krebs cycle, and oxidative phosphorylation is shown in the program.

Metabolism and Nutrition VC324206
Examines the role of ATP in biological systems, specifically the use of ATP in the action of muscle fibres. The interplay of proteins, carbohydrates and fats in the process of cellular respiration is illustrated in the context of nutrition.

Price Contact distributor

Distributor ACCESS Network

Digestive System (The): The Human Body Series, 1988 **Biology 20**

Format Video (18 minutes)

Annotation (*Authorized Student Support*)

From ingestion through digestion to elimination, the human digestive system is responsible for processing the food we eat and extracting from it the energy that makes it possible to do all human activities. In this program are images of chewing and swallowing, of the inside of the esophagus, of bile squirting from the gallbladder, and the villi lining the walls of the small intestine.

Price Contact distributor

Distributor ACCESS Network VC284501

Format	Video
Annotation	*(Authorized Student Support)*

Summary: This series shows ways in which plants and animals are interconnected within their ecosystems. From mountain plateaus to sea bottoms, it introduces a rich variety of ecosystems—identifying communities they contain and the ways in which relationships among their members affect each population's growth.

Communities (14 minutes) LRDC 247446
When several species of seabirds nest on a rocky island, their relationship in the community is shaped by competition for nesting space. In any community—a group of plants and animals living together in the same habitat—there are many relationships among different species. This program provides a look at how they interact, and:

- the difference between an open and closed community
- how competition, predation and cooperation can define the relationships among species in a community
- the features of commensal, mutual and parasitic symbiosis.

Also shown are several contrasting habitats and the different communities they contain.

Food Chains (14 minutes) LRDC 247496
This program follows a food chain from undersea kelp forests, the primary producers that collect light energy, through to primary and secondary consumers. Food chains in different aquatic ecosystems are examined:

- the difference between a simple food chain and a detritus food chain
- the difference between food chains and food webs
- what happens in a food web when a key species disappears.

This program also describes photosynthesis, defines an energy pyramid and examines a food chain to determine why there are fewer and fewer animals at each link.

Nutrient Cycles (14 minutes) LRDC 247339
Examines the nutrient cycle—a cycle that moves essential elements from the environment into the bodies of organisms and then back into the environment. Examines the nutrient cycle at work on a mountain plateau, in a rain forest, in a mangrove swamp and in the ocean. The following concepts are examined:

- the processes involved in the nitrogen, carbon, oxygen and phosphorus cycles
- how essential elements can be stored for long periods of time in wood and sediment
- how the recycling of elements is essential to life on Earth.

This program also discusses nitrogen fixation.

Populations (14 minutes) LRDC 247503

Populations are all the members of a species living in the same area at the same time, they are continually challenged by internal and external influences. The program examines the challenges populations face in order to survive, such as the environment, biological factors, territoriality and population density. The concepts examined are:

- populations increase in numbers through reproduction
- there are limits to any population's growth
- human settlements have affected many populations.

Succession (16 minutes) LRDC 247040

The program examines what happens to a habitat when it is disturbed and its old community of plants and animals dies. Succession is a process where life reappears in response to dramatic environmental change. This program looks at succession in action on a barren beach, in an untilled field and in an abandoned urban area. The concepts discussed are:

- identification of several habitat disruptions that cause biological succession
- understanding of how the relative barrenness of disturbed land can change the course of succession
- understanding that as a habitat is colonized by different plants and animals, it changes, making it possible for other species to gain a foothold and create a different environment.

Price	$ 89 each (single copy) $ 395 (single set—series of 5) $ 325 for 50 copies (bulk purchase—series of 5) $ 200 for 100 copies
Distributor	LRDC

Ecology Studies of Lakes in Alberta: Water Literacy Series, 1988 **Biology 20, Unit 3**

Format	Print
Annotation	(*Authorized Student Support* for *Environmental and Outdoor Education*) This handout deals with the ecology of freshwater environments. The human impact on lake environments is introduced, as well as the methods and technology employed to study lakes. Workshops are provided by Alberta Environmental Protection. A teacher package, 1989, includes a guide, observation notes and student worksheets.
Price	$2.45 (free with workshop from Alberta Environmental Protection) $16.50 Teacher Package (free with workshop from Alberta Environmental Protection)
Author	Alberta Environmental Protection
Distributor	LRDC 112491 112483 (teacher package)

Effects of Water Pollution (The): The Fragile Planet Series, 1990 **Biology 20**

Format	Video (19 minutes)	
Annotation	(*Authorized Student Support* for *Junior High Science*) Seals and dolphins are perhaps the most publicized victims of humankind's use of the oceans as garbage dumps. The great seal disaster of the spring of 1988 at first turned up thousands of dead and dying seals in the North Sea. The primary cause of death turned out to be a virus to which the seals fell prey because North Sea pollution had overwhelmed their immune systems. But the lesson of the seals extends beyond this one disaster to the realization that any pollutant introduced into the water enters the food chain through biological magnification. This program addresses the issue of the effects of water pollution on the ecosystem and the food chain.	
Price	Contact distributor	
Distributor	ACCESS Network	

Fifty More Things You Can Do to Save the Earth, 1989 **Biology 20**

Format	Print	ISBN 0836223020
Annotation	(*Authorized Student Support* for *Environmental and Outdoor Education*) Outlines some environmental problems and suggests practical household and community things that young people can do to make a difference.	
Price	$6.70	
Author	Earthworks Group	
Distributor	LRDC	112540

Fifty Simple Things Kids Can Do to Save the Earth, 1990 **Biology 20**

Format	Print	ISBN 0836223012
Annotation	(*Authorized Student Support* for *Environmental and Outdoor Education*) A summary of the environmental problems we face and practical things that young people can do to make a difference.	
Price	$7.50	
Author	J. Javna	
Distributor	LRDC	112368

Fishes of Alberta (The), Second Edition, 1992 **Biology 20**

Format	Print	ISBN 0888642369
Annotation	(*Authorized Student Support*) Includes up-to-date information on distribution, new species and biology of Alberta's fishes. Topics include background on the province's fishes and their environment, fishing and fish management in Alberta, postglacial origins of fish, fauna and the classification of fishes. Also included, for the 59 species of fish found in Alberta, is information on identification, taxonomic history, and, where appropriate, angling. There is a discussion of the different species of fish that were introduced to Alberta and how they have adapted to different aquatic habitats. Copies of this book were distributed to most high school libraries.	
Price	$17.85	
Author	Joseph S. Nelson and Martin J. Paetz	
Distributor	LRDC	240226

Gaia: An Atlas of Planet Management, 1984 **Biology 20**

Format	Print	ISBN 0038519072
Annotation	(*Authorized Student Support* for *Environmental and Outdoor Education* and *Social Studies 20*) This publication examines global, human and environmental problems that threaten to disrupt and exhaust life support systems on Earth. Solutions to better planet management are proposed. The resource presents a political bias that may be of concern to some people.	
Price	$17.95	
Author	N. Myers (ed.)	
Distributor	LRDC	148975

Global Warming: Hot Times Ahead, 1990 **Biology 20**

Format	Video (23 minutes)	
Annotation	(*Authorized Student Support*) The program addresses the global warming phenomenon and some of the devastating changes that may result. Greenhouse gases and how they are produced by human activities, chiefly the burning of fossil fuels, are covered. The film illustrates how the build-up of greenhouse gases can be slowed in the short term, by conserving and using gases efficiently, and how, in the long term, new ways need to be developed to use the Sun's energy.	
Price	Contact distributor	
Distributor	ACCESS Network	VC331101

Green Future: How to Make a World of Difference, 1990 **Biology 20**

Format	Print	ISBN 0140123016
Annotation	(*Authorized Student Support* for *Environmental and Outdoor Education*) Explores major environmental issues and offers practical suggestions for daily, positive action.	
Price	$14.25	
Author	L. Johnson	
Distributor	LRDC	112417

Home and Family Guide: Practical Action for the Environment, 1989 **Biology 20**

Format	Print	ISBN 0929010019
Annotation	(*Authorized Student Support* for *Environmental and Outdoor Education*) Practical information on how to tackle environmental issues in day-to-day life, recognizing that, collectively, humankind can have a tremendous positive influence on the environment.	
Price	$6.70	
Author	L. Ward-Whate	
Distributor	LRDC	112516

Immune System (The): Your Magic Doctor, 1988 **Biology 20**

Format	Video (21 minutes)
Annotation	(*Authorized Student Support*) An explanation, through the use of animation, of how the immune system works.
Price	Contact distributor
Distributor	ACCESS Network

Invitations to Science Inquiry, Second Edition, 1992 **Biology 20**

Format	Print	ISBN 187810621X
Annotation	(*Authorized Teaching Resource* for *Science 10* and *Science 20–30*) Discrepant events are set up in such a way as to pose questions and ask for explanations. The description of discrepant events is organized to provide guidance for conducting a science inquiry. Emphasis has been placed on the use of simple material so that most of the events can be carried out with things that are found in everyday life or can be bought in local stores.	
Price	$56	
Author	Tik Liem	
Distributor	LRDC	242313

Kananaskis Country Environmental Education Teaching Activity Guide: Earth Science, 1987 **Biology 20**

Format	Print	
Annotation	(*Authorized Teaching Resource* for *Environmental and Outdoor Education*) Three units, Earth History, Geologic Processes and Geologic Materials, have activities arranged by topics elaborating on one or more key concepts in environmental education. Included are: change, adaptation, ecosystems, interdependence, cycles, resources and technology. The activities also encourage an examination of personal values and attitudes.	
Price	$23.80	
Author	P. Hunt	
Distributor	LRDC	112532

Movement of Matter Through Cell and Organelle Membranes: Program 15: Senior High Science Series, 1992

Biology 20

Format	Video (10 minutes)	
Annotation	(*Authorized Student Support*) Cell and organelle membranes regulate the passage of substances throughout the human body. Several of the transport mechanisms are demonstrated using models, illustrations and computer animated sequences.	
Price	Contact distributor	
Distributor	ACCESS Network	BPN 302215

Natural Regions of Alberta—Poster Series, 1990

Biology 20, Unit 3

Format	Resource Manual and 5 Posters	
Annotation	(*Authorized Teaching Resource* for *Junior High Science*) The main objective of this material is to illustrate the beauty and the geological, geographical and environmental diversity in Alberta. It provides suggestions for activities to help teachers integrate posters into their daily lessons.	
Price	$30.50	
Author	B. Ogston	
Distributor	LRDC	143149

Natural Selection, 1985

Biology 20–30

Format	Video (30 minutes)
Annotation	(*Authorized Student Support*) Part 1: Natural Selection and Microevolution Part 2: Gradualism versus the Punctuated Theory of Evolution This program explains how the principles of natural selection account for the changes in life forms as evidenced by the fossil record.
Price	Contact distributor
Distributor	ACCESS Network

Nelson Biology: Classroom Resources, 1993

Biology 20–30

Format	Print	ISBN 0176038620
Annotation	(*Authorized Teaching Resource*) This is an ancillary to the basic text. It provides in-depth treatment of many science–technology–society connections, as well as aids to assessment, such as questions, case studies and laboratory activities. Other features include weekly planners, blackline masters, projects, concept maps, crossword puzzles and insights by scientists on recent research.	
Price	$119.05	
Author	Bob Ritter et al.	
Distributor	LRDC	252065

Nelson Biology Teacher's Resource, 1993

Biology 20–30

Format	Print	ISBN 0176038612
Annotation	(*Authorized Teaching Resource*) This resource correlates with the program of studies and the basic text. It features laboratory demonstrations and activities, case studies, questions, social issues, career investigation, research in Canada, concept maps and summary tables for organizing main concepts and information.	
Price	$42.85	
Author	Bob Ritter et al.	
Distributor	LRDC	238768

One-Minute Readings: Issues in Science, Technology, and Society, 1992

Biology 20–30

Format	Print Student Book Teacher Manual	 ISBN 0201231573 020123159X
Annotation	(*Authorized Student Support* and *Authorized Teaching Resource*) Contains readings and questions related to issues in science, technology and society. Applications of science are raising tough questions and are creating problems that cannot yet be answered. The book gives practice in making the kinds of decisions experienced in life. Students need a knowledge of science to find not necessarily the right answers, but the best possible answers.	
Price	$10.70 Student Book $8.50 Teacher Manual	
Author	Richard F. Brinckerhoff	
Distributor	LRDC	105628 (student book) 105636 (teacher manual)

Format	Laserdisc Videocassette Videodisc	
Annotation	(*Authorized Student Support*) This series begins with a 30-minute introductory video, The Program in Action, and then three, one-hour interactive videos exploring the topics biotechnology, toxic waste and water. The series develops critical thinking about science, technology and society, examines basic applications, and points out unforeseen problems or complications often emerging as a consequence. Introductions contain docudramas with strong language and confrontation.	
Price	$345 Videodisc	
Distributor	Technovision Inc.	Laserdisc
	National Film Board of Canada	Videocassette
	Technovision Inc.	Videodisc

Photosynthesis Series, 1987

Format

Video: Six, 10-minute videos

Annotation

(*Authorized Student Support*)

Summary: 3-D animation shows the process of photosynthesis at the molecular level.

Seeing the Light VC324501
Introduces the process of photosynthesis, through the historical discoveries of Joseph Priestley, Jan Ingenhousz and Jean Senebier. The photosynthesis equation is developed step by step, with reference to the role played by each of the reactants, from the raw materials to the finished product. Some community members may be sensitive to the presence of a cartoon mouse kept in a bell jar.

Absorbing the Light VC324502
Explores the stages of photosynthesis at the cellular level, using computer animation. Two photosystems, P680 and P700, are introduced.

The Light Reaction VC324503
Explores the light reaction, using computer animation. The program follows the path of electrons through the P680 and P700 photosystems, and eventually, out into the stroma, where they are used in the dark reaction.

The Dark Reaction VC324504
Describes the step by step developments in the dark reaction, including the processes in the Calvin cycle and the production of glucose and starch. Some community members may be sensitive to the brief fantasy reference to "Darth Vader and the dark side" in this program.

C3 and C4 Plants VC324505
Explores the ability of plants to use atmospheric carbon dioxide. The concept of carbon 3 versus carbon 4 plants is extensively developed at the molecular level, using computer animation.

The Fluid Transport System VC324506
Looks at the carbon cycle, and illustrates the role that plants play in ensuring the survival of all animal life. Using the California redwood as a model, the intricate dual system of fluid transport is examined.

Price

Contact distributor

Distributor

ACCESS Network

Planet Under Pressure Series, 1991

Format Video: Eight, 20-minute videos

Annotation (*Authorized Student Support*)

Acid Assault (The)

Beginning with a chemical overview of acids and bases, the program explains the formation, chemical nature and effects of acid rain on biota. The deaths of a lake and a tree are described in detail, as are the effects of pH on the environment.

Comfort Blanket (The)

This analysis of Earth's atmosphere illustrates the blend of elements that protects life in the biosphere and acts as a planetary thermostat. The effects of solar radiation are discussed, as well as the role of carbon dioxide and other gases in trapping heat and providing a "comfort blanket" for life on Earth.

Living Soil

This program shows how nutrients are replenished in healthy soil, and how soil is lost through deforestation and outdated agricultural techniques. Also, a look at the relationship between declining soil quality and a growing reliance on chemical fertilizers to increase food production.

Oxygen Partnership

A look at the atmosphere's composition and role as a heat engine and solar shield. The program explores the relation among the evolution of life and the appearance of oxygen in the atmosphere, the development of the ozone layer, and the implications of shifts in the balance of atmospheric components. The statement, "We are terminating a three billion year experiment," which reflects humankind's impact on the Earth, could be discussed from a variety of perspectives.

Ozone

The 1980s discovery of a hole in the ozone layer initiated the phasing out of chlorofluorocarbons by industries. The program explains the chemistry of destruction of the ozone layer caused by the buildup of CFCs in the atmosphere.

Sharing Carbon

The program shows how the movement of carbon and other elements throughout the global biosphere supports life. The biosphere's capacity to adjust to changes in the balance of nutrients is explored, and the disruptive influence of human activity on these global systems is discussed.

Water, Water Everywhere

A look at the properties of water and its chemical and physical ability to dissolve and transport minerals and nutrients. A sewage treatment operation is examined, and the properties of hazardous waste are discussed. The phrase, "Poison, the lifeblood of the planet," which reflects humankind's impact on the Earth, could be discussed from a variety of perspectives.

Winds of Change

Relating changes in global temperature to extinction of species through history, this program speculates that projected global warming will result in mass extinction. As increased concentrations of carbon dioxide and methane trap heat in the atmosphere, the potential for the development of a dangerous situation grows.

Price Contact distributor

Distributor ACCESS Network

Project Wild: Secondary Activity Guide, 1985 **Biology 20**

Format	Print
Annotation	(*Authorized Teaching Resource* for *Environmental and Outdoor Education*) A collection of interdisciplinary and supplementary environmental education materials emphasizing wildlife conservation. Activities are indexed by topic, grade, subject and skill.
Price	Free
Distributor	Alberta Environmental Protection

Protein Synthesis: Program 14: The Senior High Science Series, 1992 **Biology 30**

Format	Video (10 minutes)
Annotation	(*Authorized Student Support*) Living cells synthesize proteins from the master blueprints contained in DNA. Two processes are required: transcription, which involves creating an m-RNA template, and translation involving the manufacture of specific proteins. Laboratory demonstrations and computer animated sequences are used.
Price	Contact distributor
Distributor	ACCESS Network BPN 302214

Protein Synthesis Series, 1984

Format Video: Six, 10-minute videos

Annotation *(Authorized Student Support)*

Summary: Each program explores one aspect of the protein synthesis process, from the manufacture of DNA to the roles of the messenger and transfer RNA. Computer animations make this complex subject easily understood. The video series lacks the presence of females.

The Molecule of Heredity VC324602
The synthesis of protein begins with the DNA molecule. Found in the nucleus of all cells, DNA molecules are grouped in complex structures called chromosomes. The two outer strands of a DNA molecule are coiled in a double helix, between these two strands, two kinds of molecules link to form endless possible sequences. The order of these sequences constitutes the genetic code for the construction of protein.

DNA Replication: The Repeating Formula VC324603
The step by step synthesis of a DNA molecule is shown. The fertilization of an egg initiates the process of cell division that grows into the living organism. The ability of DNA to replicate itself during the process of cell division enables the blueprints for creating proteins to be passed on.

RNA Synthesis: The Genetic Messenger VC324604
Every living species relies on the accuracy of DNA replication; and RNA, or ribonucleic acid, plays an essential role in this process. The information of the DNA strand is carried by the messenger RNA to the ribosome, the site of protein synthesis.

Transfer RNA: The Genetic Messenger VC324605
The functions of the three different types of RNA—messenger, transfer and ribosomal—are explained. The transfer RNA acts as a vehicle for the amino acids, ferrying them to the ribosome, where they link up with the messenger RNA molecules to form a protein chain.

Ribosomal RNA: The Protein Maker VC324606
Ribosomal RNA and protein make up the ribosome, a complicated organelle that monitors the interaction between messenger RNA and transfer RNA. As explained in this program, the mutations that result from the faulty replication of a DNA code are usually harmful, but they are also believed to be the basis of evolution.

The Stuff of Life VC324601
Proteins are found everywhere in all living organisms. This program examines the marvellously varied protein compounds, their biological functions, the way they bind, and how organisms synthesize the complex chains of amino acids that make up proteins.

Price Contact distributor

Distributor ACCESS Network

Reproductive System: The Human Body Series, 1988

Biology 30

Format	Video (22 minutes)
Annotation	(*Authorized Student Support*) Chronicles fertilization, the union of the sex cells, and the development of a new human life.
Price	Contact distributor
Distributor	ACCESS Network

Science Process and Discovery

Biology 20–30

Format	Print Text, 1985 Teacher's Guide, 1989	 ISBN 0201186284 0201186314
Annotation	(*Authorized Teaching Resource*) • Examines significant events in the history of science and topics of current research through the use of short case studies. • Written for the general-level science student, but allows deeper analysis of the scientific method for the more advanced student. • Short narrative articles are followed by two different question sets. • Analysis provokes thinking about the cycle of proof and scientific principles. • Accompanying teacher's guide contains objective questions for each narrative.	
Price	$17.65 Text $23.65 Teacher's Guide	
Author	Dennis Field	
Distributor	LRDC	236374 (text) 238403 (teacher's guide)

Senior High Science Video Series, Programs 1–5, 1990 **Biology 20–30**

Format	Video
Annotation	(*Authorized Student Support*)

Program 1: Baking Better Science BPN 302201
Program 2: Zapped BPN 302202
Program 3: Teaching from the STS Approach: The Nature of Science BPN 302203
Program 4: Teaching from the STS Approach: Science and Technology BPN 302204
Program 5: Teaching from the STS Approach: The Social Context of Science and Technology BPN 302205

Programs 2 to 5 are teacher inservice video programs and are available on one tape.
Programs 3 to 5 show teachers practising science-technology-society strategies and interviewing educators and students about these methods. The teachers involved were practising the strategies in their classrooms in the fall of 1990—before implementation of most of the new programs, Science 14–24 being the exception.

Price	Contact distributor
Distributor	ACCESS Network

Two Minutes a Day for a Greener Planet, 1990 **Biology 20**

Format	Print	ISBN 0006376916
Annotation	(*Authorized Student Support* for *Environmental and Outdoor Education*)	
	Quick and simple things that can be done to save the Earth.	
Price	$4.70	
Author	M. Lamb	
Distributor	LRDC	112384

Understanding Biology, Second Edition, 1991 **Biology 20–30**

Format	Video	ISBN 0801625246
Annotation	(*Authorized Student Support*) Written at an introductory college level, this text is organized into three broad areas: basic biological principles, ecology, the structure and function of organisms. The first half of the text is devoted to principles shared by all organisms, and the second half is devoted to particular organisms, with an emphasis on vertebrate biology.	
Price	$52.35	
Author	Peter H. Raven and George B. Johnson	
Distributor	LRDC	240820

Water Quality Questions: The Nature and Importance of Water Quality Variables in Alberta, 1988 **Biology 20, Unit 3**

Format	Print	
Annotation	(*Authorized Student Support* and *Authorized Teaching Resource* for *Junior High Science*) Uses the topic of Alberta water to bridge scientific, technological and social aspects. Included are: a student booklet, a teacher's guide, "river monitoring" masters and transparencies, and a special "indoor field study". Workshops are provided by Alberta Environmental Protection.	
Price	$2.45 Student Package, 1990 $18.80 Teacher Package (free with workshop from Alberta Environmental Protection)	
Author	Alberta Environmental Protection	
Distributor	LRDC	143280 (student package) 143272 (teacher package)

What Can We Do for Our Environment: Hundreds of Things to Do Now, 1990 **Biology 20**

Format	Print	
Annotation	(*Authorized Teaching Resource* for *Environmental and Outdoor Education*) Hundreds of ideas of things to do to protect and improve the environment.	
Price	Free (limited quantity)	
Distributor	Environment Canada	

Other Learning Resources: General

The resources identified below have not been evaluated by Alberta Education. These listings are not to be construed as an explicit or implicit departmental approval for use. They are provided as a service only to assist school authorities to identify resources that contain potentially useful ideas. The responsibility to evaluate these resources prior to selection rests with the user, in accordance with any existing local policy.

Note: Prices of resources are listed as provided by distributors, May 1993. Check with distributor for current rates.

Laboratory Interfaces

Champ II	**Biology 20–30**
Format	MS–DOS and Macintosh
Annotation	Users perform/analyze experiments using probes, software and computer hardware.
Price	Contact distributor
Distributor	Merlan Scientific

Leap	**Biology 20–30**
Format	MS–DOS/Apple II/Macintosh
Annotation	Users perform/analyze experiments using probes, software and computer hardware. Interdisciplinary Lab Pac (physics/chemistry) and Biology and Principles of Technology Lab Pac (applied physics) are available. Laboratory pacs include manuals, interface card, software and several probes/cables.
Price	Contact distributor
Distributor	Quantum Technology Inc.

Personal Science Lab	**Biology 20–30**
Format	MS–DOS
Annotation	Users perform/analyze experiments using probes, software and computer hardware.
Price	Contact distributor
Distributor	Contact local software outlet

Biology 20 Assessment Resources Package (Item Bank), 1993 **Biology 20**

Format	LXR test format and print	
Annotation	Consists of four unit examinations and one year-end examination for Biology 20. Two formats are available: • LXR test format (Macintosh) on five, 3½" discs • print format, user's guide and accompanying graphics. Also see *Science 20 Assessment Resources (ASCII Format)*, 1993.	
Price	$11.15	
Distributor	LRDC	237893

LXR Test **Biology 20–30**

Format	Macintosh	
Annotation	Test-generating program in three versions: personal, professional and scoring editions. The item banks on the Scoring Edition take full advantage of its additional features; however, they also work with the other two editions. For novices, there may be some "challenges" associated with using the Personal Edition.	
Price	$599 U.S. (Site Licence) Personal $799 U.S. (Site Licence) Professional $999 U.S. (Site Licence) Scoring	
Distributor	Logic eXtension Resources	

Science 20 Assessment Resources (ASCII Format), 1993 **Biology 20**

Format	MS–DOS (ASCII text format) Macintosh (ASCII text format)	
Annotation	MS–DOS includes four unit examinations and one final examination on a 3½" disc, as well as print material, user's guide and accompanying graphics for **Biology 20**, Chemistry 20, Physics 20 and Science 20. Macintosh includes four unit examinations and one final examination on five 3½" discs, as well as print material, user's guide and accompanying graphics for **Biology 20**, Chemistry 20, Physics 20 and Science 20.	
Price	$21 each	
Distributor	LRDC	237869 (MS–DOS) 237835 (Macintosh)

SimEarth **Biology 20–30**

Format	MS–DOS/Macintosh/Windows	
Annotation	This is a planet simulator based on Lovelock's Gaia theory. The planet is treated as a whole: life, climate, the atmosphere, and the planet itself—from dirt and rock to the molten core—all affect each other.	
Price	Contact distributor	
Distributor	Contact local software outlet	

Atoms to Anatomy, 1992 **Biology 20–30**

Format	Videodisc
Annotation	Contains images for teaching human anatomy and physiology. Three-dimensional models of selected organs, tissues, cells and molecules can be tilted and rotated with accompanying computer software. The anthology includes selected views of the central nervous system, hearing and balance, skeletal and muscular structures, vision, respiration, circulation and cardiology. From the molecular level to the conceptual strand, 3-D reconstructions of a beating heart, and views of neurons firing, can be accessed. Example:

Level	**Sample of Images**
Molecular	Rhodopsin with retinal movement
Cellular	Rods and cones
Microanatomy	Ciliary muscles and lens accommodation animation
Gross anatomy	Visual pathway, whole eye with muscles

Price	$695
Distributor	Videodiscovery Inc.

BioSci II, 1990 **Biology 20**

Format: Videodisc

Annotation

- Contained are 2300 still photos, 100 film sequences with narration and 500 computer graphic diagrams.
- Eight full dissections of the frog, fetal pig, earthworm, mussel, squid, crayfish, sea star, perch and cat muscles in labelled, unlabelled and quiz formats.
- "Tour of the Cell"—a voyage around the organelles of a cell in 3-D computer animation.
- Films of classic animal behaviour, continental drift, seasons, protein synthesis, physiology, and how to use a microscope.
- Directory categorized by common name, scientific name, instructional concept and frame number. Each entry has a bar code, which can be read by a Pioneer Barcode Reader.

Price	$549
Distributor	Videodiscovery Inc.

Evolution: Inquiries into Biology and Earth Science, 1992 — Biology 20

Format

Videodisc
Teacher's Guide — ISBN 156307088X

Annotation

Package components: Evolution Videodisc—CAV, 1 side; Teacher's Guide, annotated, 370 pages; 25 Student Manuals (biology or Earth sciences)

(D) Teacher's Guide and videodisc; (T) Teacher's Guide only

1. Change (D)
2. How Long Is a Long Time? (D)
3. Patterns and Purpose (D)
4. Can Humans Live on Mars? (D)
5. Adaptive Radiation and Convergence (D)
6. Rate of Evolutionary Change (T)
7. Trace Fossils (D)
8. Variation in the Fossil Record (D)
9. Mass Extinction and Adaptive Radiation (T)
10. Science and the Age-of-the-Earth Debate (T)
11. Methods of Science (T)
12. Humans and Apes: A Question of Origins (D)
13. Where Have All the Dinosaurs Gone? (D)
14. Natural Selection (D)
15. Adaptation (D)
16. Grouse: An Evolution Problem (D)
17. Grouping Objects and Animals (D)
18. Genetics and Evolution (T)
19. The Evolution of Human Disease (D)
20. Human Variation, Evolution and Modern Disease (T)
21. Cultural Evolution (D)

Price

$495	Evolution: Biology Package
$495	Evolution: Earth Science Package
$15	each or $100 (set of 10) Additional Student Manuals

Distributor

Videodiscovery Inc.

Frog Anatomy and Physiology Library, 1988

Biology 20

Format	Videodisc
Annotation	This program contains 150 slides, 60 diagrams and 34 movie clips that provide a detailed review of amphibian anatomy and physiology. It offers an alternative to dissection. Slides display such subjects as embryology, metamorphosis, major tissues, bones and muscles. Movie clips include studies of anatomy and physiology of all the major organs and systems and show a variety of frogs in their natural habitat.
Price	$595 U.S. Multimedia Library $345 U.S. Frog Anatomy Discs only
Distributor	Optical Data Corporation

Garbage: The Movie—An Environmental Crisis, 1990

Biology 20

Format	Videodisc (24 minutes)	
Annotation	This is a look at the problem of the environment and solid waste, presented in the vernacular. Landfills, incinerators, recycling plants and composting yards are visited. The reasons why landfills are closing, how the garbage crisis is creating pollution and the search for the roots of the problem are explored. Some solutions offered are: recycling, reusing, reducing use, consumer choices and organized action.	
Price	Contact distributor	
Distributor	ACCESS Network	BPN 33100

Geology and Meteorology, 1985

Biology 20

Format	Videodisc
Annotation	This program has more than 7200 slides, a 400-term glossary and 34 movie clips on Earth geology. The slide collection includes plate tectonics, volcanic formation and the many ongoing weathering processes affecting the Earth. Movie clips examine volcanoes, including Vesuvius and Heimaey Island; tectonics, including the dynamics of continents and the evolution of North America; meteorology, including rain and cloud droplets, thunderstorms, hurricanes and tornadoes; weathering, including glacial melting, erosion and cratering; and rocks and minerals, including composition, formation and lunar rock samples.
Price	$995 U.S. Multimedia Library $595 U.S. Discs only
Distributor	Optical Data Corporation

Our Environment, 1990 **Biology 20**

Format	Videodisc
Annotation	Contained are 6000 environmental colour photos sequenced with explanatory captions, maps, diagrams and film segments. The disc includes: • the four spheres of air, water, land and organisms • a focus on important environmental problems, such as acid rain, energy usage, climate change, desertification, wetlands loss, tropical deforestation, oil spills, nuclear power and weapons, soil erosion, solid waste, species extinction, asbestos and water pollution • a visual glossary illustrating over 700 environmental terms and surveying the globe with captioned photos.
Price	$395 U.S. Videodisc $30 U.S. Teacher Manual $15 U.S. Student Manual $70 U.S. HyperCard Stacks
Distributor	Optilearn

Teacher Background

Atlas of Alberta Lakes (The), 1990 — **Biology 20**

Format	Print	ISBN 0888642156
Annotation	This atlas focuses on 100 of Alberta's most interesting, most popular or most studied lakes. By exploring the intricacies and dynamics of the lake systems in Alberta, their recreational use and economic importance, the atlas provides all the information lake users, anglers, cottage owners, scientists and lake managers might need. The introduction explains the scientific terms and concepts used in each chapter and includes a full-page colour map showing the locations of the 100 lakes according to drainage basins. A user's guide simplifies the organization of individual chapters.	
Price	$60	
Distributor	UBC Press	

Biological Science 1 and 2, Second Edition, 1990 — **Biology 30**

Format	Print	ISBN 0521383803
Annotation	This book provides up-to-date information on all topics in the biological sciences. Through case studies, attention is paid to the affects of humankind on the environment, and organisms and their environment. For example, pollution is linked with disruption of biogeochemical cycles and issues, such as the greenhouse effect, eutrophication, the ozone layer and acid rain. Applications of population ecology are included; for example, fisheries management and sections on agricultural and horticultural practices and pesticides. A section on human reproduction is also featured.	
Price	Contact distributor	
Distributor	Cambridge University Press	

Biology: Principles, Patterns and Processes, 1989 — **Biology 20–30**

Format	Print	ISBN 0471796298
Annotation	This text, with practical applications, provides a foundation of knowledge for the study of biology at the senior level.	
Price	Contact distributor	
Author	Don Galbraith	
Distributor	John Wiley & Sons Canada Limited	

Biology Today (Teacher Annotated Text), 1991 — Biology 20–30

Format	Print	
	Student Text	ISBN 0030353572
	Teacher Annotated Text	0030376335
	Laboratory Investigations	0030475929
	Teacher's Guide with Key to Laboratory Investigations	0030475945
	Teaching Transparencies	0030476283
	Blackline Masters	Part Number W32595
Annotation	A source of background information relating to major topics in the program of studies.	
Price	Contact distributor	
Author	Harvey Goodman et al.	
Distributor	Harcourt Brace and Company Canada	

Biotechnology Workbook, 1991 — Biology 30

Format	Print	ISBN 0130824887
Annotation	The reader is introduced to the scope of modern biotechnology. Each chapter highlights a specific technology, explaining the basic science behind it, its history, future and applications.	
Price	Contact distributor	
Author	William J. Netzer	
Distributor	Prentice-Hall Canada Inc.	

Canadian Environmental Education Catalogue: A Guide to Selected Resources and Materials, 1991 — Biology 20

Format	Print
Annotation	Contains a comprehensive list of environmental resources.
Price	$20 main volume $40 two-year subscription (main volume plus supplementary volumes, one every 6 to 8 months)
Distributor	Pembina Institute

Clarification of Statements Prohibiting the Use of Human Body Substances in the Alberta Science Curriculum, 1988 **Biology 20–30**

Format	Print	
Price	$2.80	
Author	Alberta Education	
Distributor	LRDC	158643

Complete Handbook of Science Fair Projects (The), 1991 **Biology 20**

Format	Print	ISBN 0471527297(c) 0471527289(p)
Annotation	Contains 50 award-winning projects from actual science fairs, described in detail with accompanying illustrations and 500 other suggested science fair topics suitable for junior and senior high science students. Detailed guidelines for preparing a science fair project are outlined. This includes selection of topic, obtaining materials, recording data and suggestions for oral presentation.	
Price	$18.50	
Author	Julianne Blair Bochinski	
Distributor	John Wiley & Sons Canada Ltd.	

Conservation Strategy, 1988

Format Print (pamphlets)

Annotation This series of discussion papers covers:

- Tourism in Alberta
- Agricultural Considerations for Today and Tomorrow
- Healthy Planet, Healthy People
- Oil and Gas in Alberta: An Uncertain Future
- Foundations for the Future: Alberta's Mineral Resources
- Energy Conservation: A Goal for Albertans
- Renewable Energy: The Power and the Potential
- Environment by Design
- Reserves for Nature
- A Place for Wildlife
- Environmental Education for a Sustainable Future
- Dinosaurs and Distant Drums
- Perspectives for an Alberta Conservation Strategy
- Resolving Conflict: A Case Study
- Alberta Conservation Strategy: Strategic Framework in Action
- Alberta Conservation Strategy: Strategic Framework in Brief
- Alberta Wetlands: Water in the Back
- Our Dynamic Forests: The Challenge of Management
- People, Parks and Preservation
- Electricity: Development for a Sustainable Future
- Saving the Strands of Life: Alberta's Biodiversity.

Price Free

Author Alberta Conservation Strategy Project

Distributor Environmental Council of Alberta

Destination Conservation, 1990

Format	Print
Annotation	This manual was written especially for schools seeking to improve their energy, water and waste management practices, and covers: 1. The Program Begins Initial Awareness Activities Determining Energy and Resource Consumption Levels 2. Taking Action Energy Audit and Action Plan Conservation Campaign Resource Audit and Action Plan 3. Further Awareness and Action A Global Perspective Individuals Can Make a Difference Environmental Connections Overpopulation Energy and the Environment Transportation Global Warming/Greenhouse Effect Ozone Layer Depletion Deforestation Water Conservation Ecological Landscaping and Gardening Waste Management Cost Recovery Program for Paper Hazardous Materials
Price	$35
Distributor	Environmental Resource Centre

Discoveries in Biology: Non-destructive Investigations with Living Animals, 1992

Biology 30

Format	Print	ISBN 0773052062
Annotation	This book emphasizes the process of science and has over 50 noninvasive investigations. The text encourages creative and reasoned responses to questions about the behaviour, physiology, reproduction, growth and ecology of small animals that are easy to obtain and keep in the classroom. The exercises cover a range of learning levels and encourage curiosity. The primary objective of the investigations is to promote respect of and responsibility for living animals.	
Price	Contact distributor	
Author	D. M. Ogilvie and R. H. Stinson	
Distributor	Copp Clark Pitman Ltd.	

Energy Alternatives: Transparency Masters and Discussion Notes

Biology 20–30

Format	Print
Annotation	The materials in this resource focus on making the best choices to meet Canada's future energy needs. Forms of energy alternatives are examined, as well as the advantages and disadvantages of each energy source. Decisions to determine which energy sources should be pursued, and where facilities should be located, are very complex in nature. Each of eight sections contains information about current technologies, and national and international energy resources research. Transparency masters can be used to initiate discussion.
Price	Free
Distributor	P. J. Spratt & Associates Inc.

Environmental Issues/An Overview, 1989

Biology 20–30

Format	Print
Annotation	The Canadian Association of Petroleum Producers has published a series of pamphlets on important environmental issues, including sour gas, waste management, water quality and oil spills in Canada's frontiers. This particular pamphlet is an overview of the industry's concern for environmental matters, research and safety, industry and the community, industry and the government, and industry and the economy.
Price	Free
Distributor	Canadian Association of Petroleum Producers

Environmental Science Activities Kit, 1993 — **Biology 20–30**

Format	Print	ISBN 0876283040
Annotation	This book contains a collection of hands-on classroom activities promoting the understanding of natural and human-made environments; and awareness of environmental problems and their solutions.	
Price	$27.95 U.S.	
Author	Michael L. Roa	
Distributor	Center for Applied Research in Education (The)	

Focus on Research: A Guide to Developing Students' Research Skills, 1990 — **Biology 20–30**

Format	Print	
Annotation	Outlined is a resource-based research model to help manage information efficiently and effectively, and gain transferable skills to all work situations. The model provides a developmental approach to doing research.	
Price	$4.10	
Author	Alberta Education	
Distributor	LRDC	161802

Health and Safety on the Job: Audio-visual Catalogue, 1992 — **Biology 20**

Format	Print (catalogue)
Annotation	Lists several audio-visual resources available from the Alberta Labour Library.
Price	Free
Distributor	Alberta Labour Library

Higher Grade Biology, 1991 **Biology 30**

Format	Print	ISBN 034053611X
Annotation	This book provides questions that can be selected and modified to consolidate knowledge and understanding, as well as give practice in problem solving, experimental design and data interpretation. Summaries of key concepts are provided to reinforce learning. These can be used to extend topics and provide questions for assignments or quizzes.	
Price	Contact distributor	
Author	James Torrance	
Distributor	Pippin Publishing Ltd.	

How Safe Is Enough? 1983 **Biology 20–30**

Format Video (18 minutes)

Annotation This program is an introduction to risk-benefit analysis. Its aspects are discussed by a group of three students and an instructor:

- most human activities involve some risk
- a number of activities are ranked according to the number of deaths they cause in Canada
- risk perceptions vary from person to person. Inaccurate evaluations are dependent on preconceptions due to personal experience
- risk analysis involves estimating the consequences of risks and the probability of their occurrence, a mathematical equation is derived
- risk analysis assists in the decision-making process of individuals.

The video is accompanied by a teacher's guide entitled *On the Perception, Estimation and Evaluation of Risk.*

Price Contact distributor

Distributor P. J. Spratt & Associates Inc.

Human Biology Activities Kit, 1993

Biology 20–30

Format	Print ISBN 0876281218
Annotation	This book contains a collection of over 200 classroom-tested activities and worksheets, most of which relate to topics in the program of studies, others provide useful background information. • Unit 6 – The Circulatory System Lesson 1 – Investigating a Drop of Blood • Unit 9 – The Digestive System Lesson 9 – Simulating the Steps of Digestion • Unit 10 – The Excretory System Lesson 10 – Internal Anatomy of the Kidney • Unit 11 – Reproduction Lesson 11 – Making a Plaster Model of the Human Embryo. The important health issue of acquired immunodeficiency syndrome (AIDS) gets detailed coverage in a series of lessons on the immune system.
Price	$27.95 U.S.
Author	John R. Roland
Distributor	Center for Applied Research in Education (The)

Individual Anatomy Charts Series, 1992 **Biology 20–30**

Format Print

Annotation Full colour charts with transparent overlays identify important anatomical areas, functions and features. All charts are prepunched for standard 3-ring binders. Most titles are appropriate for application to topics covered in Biology 20, Unit 4 and Biology 30, Unit 1 and Unit 2.

Titles	Application	ISBN
Autonomic Nervous System	B30, U1	841615292
Blood Cells Chart	B20, U4	841615160
Brain Part 1 Chart	B30, U1	84161525X
Brain Part 2 Chart	B30, U1	841615268
Development Embryo Chart	B30, U2	841615101
Development of Blood Cells Chart	B20, U4	841615152
Digestive System Chart	B20, U4	841615047
Diseases of the Blood Chart	B20, U4	841615179
Endocrine System Chart	B30, U1	841615217
Female Reproduction Chart	B30, U2	84161511X
Heart Chart	B20, U4	841615039
Human Body Back Chart	B20–30	841615207
Human Body Front Chart	B20–30	841615187
Human Skeleton Chart	B20–30	841615004
Lymphatic Nodes/Vessels Chart	B20, U4	841615241
Male Reproductive Organ	B30, U2	841615128
Respiration Chart	B20, U4	841615017
Respiratory System Chart	B20, U4	841615063
Skin Chart	B20–30	841615020
Tissue Chart	B20–30	841615284

Price $2 each

Distributor Fitzhenry and Whiteside Ltd.

Levitating Trains and Kamikaze Genes: Technological Literacy for the 1990's, 1991 **Biology 20**

Format Print ISBN 0060973692

Annotation This is a guide to technological literacy with a list of topics on space technology, biotechnology, computer literacy, energy, superconductivity, high technology, health and transportation.

Price $11.95

Author Richard P. Brennan

Distributor Harper Collins Books of Canada Ltd.

Living Flow—Teaching Kit (The), 1992 **Biology 20**

Format	Print
Annotation	This resource includes a teaching guide, 2 copies of a poster, and duplicating masters on the back of one of them. The topics addressed are sources of water in Alberta, uses of water, water conservation and management.
Price	Free
Distributor	Alberta Environmental Protection

Main Points in Biology, 1986 **Biology 20**

Format	Print ISBN 0701620315
Annotation	A text that lists the terms and ideas in biology in dictionary style. Illustrations and full index included.
Price	$14.50
Author	Bill Stephenson and Mark Woodford
Distributor	John Wiley & Sons Canada Ltd.

Mammals of the North American Parks and Prairies, 1990 **Biology 20**

Format	Print ISBN 0969448201
Annotation	This book provides a description, distribution, life history, the common and scientific name, plus what the scientific name means, for each native mammalian species, as well as many introduced species, to the Canadian prairies and the states of Montana and North Dakota. It mentions the most significant parasites and diseases, especially those transmissible to humans. Keys were developed to identify all mammals in the area to species, either from an available specimen, or from its skull. Ranges of sizes and weights of every species are provided in tables. There are 27 colour photographs; 138 line drawings; glossary of technical terms; and a reference section about particular species.
Price	$50
Author	Donald L. Pattie and Robert S. Hoffman
Distributor	D. L. Pattie

Meeting Future Energy Needs: Teachers' Guide

Biology 20–30

Format	Print	
Annotation	Describes a game simulating the use of energy resources. Players assume different roles: an energy review board, optional interest groups and interveners. They then examine a range of options to determine the best uses for future energy resources.	
Price	Free	
Distributor	P. J. Spratt & Associates Inc.	

Merrill Biology: Living Systems, 1989

Biology 20–30

Format	Print	ISBN 0675064856
	Teacher Resource Package	067586490902
	Computer Test Bank	067506497X01
	Laboratory Biology	0675064864
	Resource Master Book	0675064929
	Probing Levels of Life: A Laboratory Manual	0675064880
	Reading and Study Guide	0675064910
Annotation	A text and auxillary resources providing background on major program topics.	
Price	Contact distributor	
Author	Raymond F. Oram	
Distributor	Maxwell Macmillan Canada	

Nature of Life (The), Second Edition, 1992

Biology 20–30

Format	Print	ISBN 0070506337
Annotation	This introductory, illustrated college-level text is organized around three unifying themes: • living things take in energy to maintain their internal order and organization • living things undergo reproduction so that the species continues after the individual ceases to exist • living organisms are able to adapt to changing environments.	
Price	$66.95	
Author	John H. Postlethwaite and Janet L. Hopson	
Distributor	McGraw-Hill Ryerson Ltd.	

Power and the Promise (The), 1993 **Biology 20–30**

Format	Print	ISBN 0969715404
Annotation	This resource includes the medical research and personal profiles of some Alberta scientists who are on the leading edge of research in the genetics of cancer, infectious diseases, nerve regeneration and other areas. It reports on current medical research in the province, combined with information on patient and population health research.	
Price	Free	
Author	Alberta Heritage Foundation for Medical Research	
Distributor	Alberta Heritage Foundation for Medical Research	

Science Matters: Achieving Scientific Literacy, 1991 **Biology 20**

Format	Print	ISBN 038526108X
Annotation	This book provides information toward becoming scientifically literate. It contains chapters on: • Scientific Literacy • Knowing Energy • Electricity and Magnetism • The Atom • The World of the Quantum • Chemical Bonding • Atomic Architecture • Nuclear Physics • Particle Physics • Astronomy • The Cosmos • Relativity • The Restless Earth • Earth Cycles • The Ladder of Life • The Code of Life • Evolution • Ecosystems.	
Price	Contract distributor	
Author	Robert M. Hazen and James Trefil	
Distributor	Doubleday Canada Ltd.	

Senior High Science Inservice Modules, 1991 **Biology 20–30**

Format	Print	
Annotation	A system-based development model for workshops, a planning manual, containing the following thirteen modules: Module 1 – Teaching for Thinking Module 2 – STS Teaching Strategies Module 3 – Controversial Issues in the Classroom Module 4 – Focus on Research Module 5 – Science 10: A Hands-on Sampler Module 6 – Performance Assessment in Science 10 Module 7 – Technology and Media in the Science Classroom Module 8 – Cooperative Learning Module 9 – Teaching for Conceptual Change Module 10 – Teaching with Gender Balance Module 11 – Questioning Techniques for Science Teachers Module 12 – Environmental Connections in the New Science Programs Module 13 – Agricultural Connections in the New Science Programs	
Price	$25 (not available individually)	
Author	Alberta Education	
Distributor	LRDC	144684

State of Canada's Environment (The), 1991 **Biology 20–30**

Format	Print	ISBN 0660142376
Annotation	This report covers environmental concerns and what Canadians are doing to address them. What are the key environmental conditions and trends in Canada? What are the links between human activities and environmental changes? What are the ecological and health dangers?	
Price	$29.95	
Author	Environment Canada	
Distributor	Environment Canada	

Structured Questions for GCSE Biology, 1987 **Biology 20–30**

Format	Print	ISBN 0340414839
Annotation	This book, for the General Certificate for Secondary Education (Britain), has science–technology–society questions in biology that can be used for tests or discussions.	
Price	Contact distributor	
Author	C. L. Liffen	
Distributor	Pippin Publishing Ltd.	

STS Science Education: Unifying the Goals of Science, 1990 **Biology 20–30**

Format	Print	
Annotation	This publication provides a comprehensive description to help integrate science–technology–society concepts into teaching strategies.	
Price	$3.25	
Author	F. Jenkins	
Distributor	LRDC	162769

Teaching Thinking: Enhancing Learning, 1990 **Biology 20–30**

Format	Print	ISBN 1550062271
Annotation	Principles and guidelines for cultivating thinking, Early Childhood Services to Grade 12, have been developed in this resource. It offers a definition of thinking, describes nine basic principles upon which the suggested practices are based, and discusses possible procedures for implementation in schools and classrooms.	
Price	$4.20	
Author	Alberta Education	
Distributor	LRDC	161521

Together We Learn (Co-operative Small Group Learning), 1990

Biology 20–30

Format — Print/Video

Annotation — This "how-to" handbook is designed to help implement small group learning strategies in the classroom. It offers the following:

- a nuts and bolts approach to cooperative learning that provides classroom suggestions and aids
- thorough coverage of cooperative learning approaches to assist teachers of varying levels of experience with group work
- suggestions that are relevant to all grades, disciplines and students
- a jargon-free, easy-to-read, treatment of cooperative learning techniques.

Price — Contact distributor

Author — R. Wideman et al.

Distributor

LRDC	Print	148959
ACCESS Network	Video	

Triumph of Discovery (The): Women Scientists Who Won the Nobel Prize, 1991

Biology 20–30

Format — Print

Hardcover	ISBN 0671693328
Softcover	0671693336

Annotation — The Nobel Prize laureate is one of the most sought after of the international honours. Nearly 500 Nobel prizes have been awarded to scientists, ten of whom were women. This book tells the story of four of these female scientists from their early struggles to their breakthrough discoveries.

Maria Goeppert	– fought prejudice toward women in science to study physics in her native Germany. Her work helped lead to the development of the atomic bomb and experimentation with shell models.
Rosalyn Yalow	– a scientist, wife and mother, whose study of nuclear physics led her to discover ways of "tagging" substances in blood with radioactive tracers.
Barbara McClintock	– overcame the opposition of her family to attend college and devote her life to the study of maize genetics.
Rita Levi-Montalcini	– survived anti-Semitism in facist Italy to train as a doctor and biologist investigating nerve growth.

Price — $13.98 U.S. Hardcover
8.95 U.S. Softcover

Author — Joan Dash

Distributor — Julian Messner

Understanding Biology, 1989 **Biology 20–30**

Format	Print	ISBN 0471796549
	Laboratory Manual	0471796352
Annotation	This text addresses practical applications in biology. For example, a knowledge of genetics has been applied to the breeding of plants and animals; and a knowledge of the physiology and reproduction of bacteria and viruses has been used in the cure and prevention of disease. The content relates to the nature of science and the ways in which scientific discoveries are made.	
Price	Contact distributor	
Author	Don Galbraith	
Distributor	John Wiley & Sons Canada Limited	

World of Biology, 1990 **Biology 20–30**

Format	Print	ISBN 0030302536
	General Biology Laboratory Manual	003026233X
	Instructor's Resource Manual	0030331137
	General Biology Laboratory Manual	0030333679
Annotation	This background source of information explores the diverse life forms that inhabit the Earth, their interdependence and their interactions with the environment.	
Price	Contact distributor	
Author	P. William Davis, Eldra Pearl Soloman and Linda R. Berg	
Distributor	Harcourt Brace and Company Canada	

Other Learning Resources: Biology 20

The resources identified below have not been evaluated by Alberta Education. These listings are not to be construed as an explicit or implicit departmental approval for use. They are provided as a service only to assist school authorities to identify resources that contain potentially useful ideas. The responsibility to evaluate these resources prior to selection rests with the user, in accordance with any existing local policy.

Note: Prices of resources are listed as provided by distributors, May 1993. Check with distributor for current rates.

Unit 1: The Biosphere

Biosphere (The): Science Now Series, 1989

[also for Biology 20, Unit 3]

Format	Print	ISBN 0748702024
Annotation	The current scope of the topic "biosphere" is surveyed by presenting recent world-wide information. This illustrated text could be used for research purposes or as a source of questions and ideas for building test items and lesson plans.	
Price	$9.95	
Author	Thomas M. Steven and David Wright	
Distributor	Copp Clark Pitman Ltd.	

Can Polar Bears Tread Water? 1990

Format	Video (60 minutes)
Annotation	Climate is considered by many to be second only to nuclear war in its potential for disrupting the human race. Filmed around the world in Canada, China, Russia, United Kingdom and the United States, this documentary analyzes the time scale of climate change and illustrates how people should respond to the potential dangers. In Canada, the focus is on the fight by a group of Native Indians against deforestation. Should the greenhouse effect be allowed to go unchecked, global warming will melt the ice, then polar bears may literally have to tread water.
Price	$425
Distributor	T. H. A. Media Distributors

Climate Change Digest: Exploring the Implications of Climate Change for the Boreal Forest and Forestry Economics of Western Canada, 1988

Format	Print (booklet)	ISBN 08353980
Annotation	This report summarizes the results of a study assessing the implications of carbon dioxide-induced climate change in the boreal forests of the Prairie provinces and the Northwest Territories. Focus of the study was on climate change influences on tree growth and physiology, and to develop a framework to assess the use of climate change/forest/economic models, and undertake preliminary climatic change impact assessments. The report identifies significant gaps in the knowledge of how the forest will respond to climate change, and also makes clear that future changes in climate caused by the greenhouse effect could have a significant impact on the boreal forests of western Canada.	
Price	Free	
Distributor	Canadian Climate Centre	

Climate Puzzle (The): Climates—Past, Present and Future: Planet Earth Series, 1986

Format	Video (28 minutes)	
Annotation	Shows that present world climate is not typical of that which prevailed during most of geological time. Explores the changing factors that brought this about.	
Price	Contact distributor	
Distributor	ACCESS Network	VC313406

Energy: Science in Focus Series, 1990 [also for Biology 20, Unit 2]

Format	Video (20 minutes)
Annotation	How do plants and animals store energy? Where does it come from? How is it released? The processes of photosynthesis, respiration and fermentation answer these energy-related questions.
Price	$320
Distributor	T. H. A. Media Distributors

Environment: Pathways Through Science Series, 1993 [also for Biology 20, Unit 2]

Format	Print	ISBN 0582094062

Annotation

This module contains strategies and activities dealing with the environment. Examples of some of the investigations are mini-ecosystems, photosynthesis, food pyramids, global warming, sewage treatment and pollution. A commentary is cross-referenced to the activities and provides background information and sample results of experiments. A source book contains science–technology–society connections related to aquatic ecosystems, environmental sustainability, organic farming and biological control. A study guide outlines main ideas for review. Some of the examples used have a British context.

Price $69.56

Distributor Copp Clark Pitman Ltd.

Fate of the Earth (Part 1): Geochemical Cycles: Planet Earth Series, 1986

Format Video (30 minutes)

Annotation

The dynamic nature of ecological and other balances in nature are addressed, as well as the importance of taking care where possibilities exist that the activities of humankind might upset these balances.

Price $99

Distributor Magic Lantern Communications Ltd.

Fateful Balance (The), 1991

Format Video (48 minutes)

Annotation

This video focuses on distinguishing between human-made changes and natural changes in the Earth's climate relative to global warming. A scientific perspective on this balance is outlined.

Price $385 (additional copies on the same order may be purchased for $125)

Distributor Omega Films

Gaia: Goddess of the Earth, 1985

Format	Video (50 minutes)
Annotation	What keeps the atmosphere of the Earth breathable? Or the oceans from freezing or boiling dry? According to Dr. James Lovelock, an atmospheric studies expert, the answer lies in the gases produced by plants and bacteria; in the bodies of minute oceanic organisms; and in mass poisoning, which took place two billion years ago. Lovelock's Gaia hypothesis—named after the ancient Greek goddess of the Earth—suggests that life itself manipulates the planet to ensure its own survival; and that the Earth and all living things upon it are part of a single, organized, self-regulating system.
Price	$495
Distributor	BBC Enterprises

Global Warming: Climate and Man Series, 1990

Format	Video (26 minutes)
Annotation	The Earth's history exemplifies temperature change; people and animals have historically moved to better climes, richer pastures, more abundant food. The problem now is that the land resources are already occupied; meanwhile, temperatures appear to be rising, with potentially dangerous consequences. The gases in the air, which cause the greenhouse effect, have made life possible; too many gases, however, create a dangerous situation. Observations, historical records, and computer models lead to the conclusion that temperatures are rising. If this trend continues, low-lying areas will be under water as ice melts and sea levels rise; diseases will proliferate; rains will increase in some parts of the world, while drought strikes elsewhere and mass starvation results.
Price	$149 U.S.
Distributor	Films for the Humanities and Sciences

Greenhouse, 1990

Format	Video (30 minutes)
Annotation	This program examines part of the scientific process that has led to predictions of greenhouse warming. It describes the greenhouse effect in detail and follows the scientific method of observation and description, collection of data, formulation of probable explanations, and the testing of these explanations, using computer mathematical models, as predictive tools. Observing • the Earth's past temperatures, using oxygen isotopes on ice cores • the quantity of greenhouse gases and the increases • the maps made by some of the different computer models Deducing the Mechanisms • making computer mathematical models, taking various factors into consideration, such as glaciers, clouds, cities, plants, etc. Predicting the Future and Testing the Predictions • by starting with known data in the past and seeing if it has accurately predicted present conditions
Price	$69
Distributor	Classroom Video

Greenhouse Effect (The), 1990

Format	Video (17 minutes)
Annotation	The program examines the causes and effects of greenhouse warming. A simulated newscast of the future sets the stage for potential changes in climate. The burning of fossil fuels, emissions from industrial sources, and slash and burn agricultural practices have contributed to the rise of human-made greenhouse gases. Climatologists are now using computer models to predict global warming. The amount of greenhouse warming is debated; however, energy conservation strategies, alternate energy sources and economic assistance to developing nations may lead to a decrease in the rate of buildup of greenhouse gases.
Price	$64.95 U.S.
Distributor	Scott Resources Inc.

Greenhouse Effect (The): Climate and Man Series, 1990

Format	Video (26 minutes)
Annotation	A life-sustaining envelope of gas surrounds the Earth. This atmosphere contains oxygen, carbon dioxide, water vapour and other gases; and this generates climate, which affects all living things. The program analyzes the Sun's gradual brightening and the relationship between sunlight and carbon dioxide. The program explains why the atmosphere of Mars has too much carbon dioxide to sustain life and Venus too little. Theories about the disappearance of dinosaurs are examined, as well as the relationship between climatic change and continental drift.
Price	$149 U.S.
Distributor	Films for the Humanities and Sciences

Greenhouse Effect (The): The Global Environment Series, 1991

Format	Video (20 minutes)
Annotation	As gases produced by living organisms on Earth continue to build up in the atmosphere, they form what may be thought of as a giant greenhouse. Under the "glass" things will get warmer, and that warming may well have undesirable consequences for our planet in the forms of drought and coastal flooding. These greenhouse gases are methane from domestic animals, chlorofluorocarbons from refrigerants and propellants, carbon dioxide from pollutants, and the reduction of carbon dioxide consumption attributed to deforestation. This program discusses the world's changing climate and some of the solutions for the greenhouse effect.
Price	$99
Distributor	Coronet Film and Video

Habitat Turned Hothouse (A): Icewalk Series, 1989

Format	Video (22 minutes)
Annotation	An early thaw creates perilous formations of grinding ice that threaten the International Student Expedition as they near the North Pole. Could global warming have been the cause of this early thaw? In this program, the greenhouse effect and the resulting damage to the environment are examined as the Icewalk explorers conduct scientific tests at the North Pole.
Price	Contact distributor
Distributor	Visual Education Centre

Horizon: The Greenhouse Effect, 1988

Format	Video (50 minutes)
Annotation	Burning fossil fuels, such as coal, oil and gas add carbon dioxide to the atmosphere. This colourless, naturally occurring gas turns the atmosphere into a greenhouse, trapping the Sun's heat and raising the temperature each year. Computer models of the world's climate are predicting serious consequences for food producers. The greenhouse effect may not be all bad as carbon dioxide is essential for plant growth, and increased amounts might lead to faster growth. Thousands of acres of forest absorb enough carbon dioxide to balance the output of a power station. However, global deforestation and the generation of power will increase the greenhouse effect.
Price	$495
Distributor	BBC Enterprises

Impacts of Global Warming (The)

Format	Print (factsheet)
Annotation	Describes some of the possible effects of a warmer climate on selected sectors of Canada, based on changes suggested by recent climate studies. Other factsheets available: "The Greenhouse Gases", "Climate Change and Variability".
Price	Free
Author	Atmospheric Environment Service
Distributor	Environment Canada

Once and Future Planet, 1991

Format	Video (28 minutes)
Annotation	This is a look at global warming and the effect that industries and lifestyles have on the Earth's atmosphere. With the aid of animation, US–Soviet research voyagers introduce the natural and human-made gases accumulating in the atmosphere in very dramatic ways. The program discusses what individuals can do to slow greenhouse gas emissions in order to give the planet's natural cycling processes a chance to catch up.
Price	$325
Distributor	McNabb and Connolly Films

Only One Atmosphere: Race to Save the Planet Series, 1991

Format	Video (60 minutes)
Annotation	This film examines the possible global warming of the Earth's atmosphere and suggests that it may be the greatest environmental challenge our planet has ever faced.
Price	$149
Distributor	Magic Lantern Communications Ltd.

Only One Earth, 1989

Format	Video (11 minutes)
Annotation	The program features National Aeronautics and Space Administration footage of the Earth from space. Global changes recorded by astronauts over the last 30 years, as a result of human activity, are presented. Topics covered are deserts, rain forests and air pollution.
Price	$49.99
Distributor	Education Through Video Ltd.

Ozone and UV Bulletins, 1993

Format	Print
Annotation	A series of thirteen, one-page reports on ozone and ultraviolet radiation developed by Environment Canada.
Price	Free
Distributor	Environment Canada

Protection of Farm-stored Grains and Oilseeds from Insects, Mites and Molds, 1990

Format	Print (booklet)	1851/E
Annotation	This booklet describes pests of farm-stored grains and oilseeds and outlines methods for their prevention, detection and control. Prolonged storage of such crops occurs mainly on the farm, so pests are most likely to cause damage in farm bins. To avoid or control damage caused by pests, the producer is encouraged to use current control practices. Safe storage methods, sound management practices and a general knowledge of insects, mites and molds, are promoted. The use of cool temperatures through aeration to protect stored crops is emphasized.	
Price	Contact distributor	
Distributor	Agriculture Canada	

Recognizing Herbicide Action and Injury, 1986

Format	Print
Annotation	Discover how to recognize the symptoms of herbicide-related causes of crop injury. Learn preventative steps. Understand the way herbicides work—how they move into plants, and where they go once inside them. Get to know where they move in the soils and how long they stay there. See what to look for when examining crops for damage and when checking weeds for signs of killing action.
Price	$8
Distributor	Alberta Agriculture, Food and Rural Development

Vista: The Greenhouse Effect, 1987

Format	Video (60 minutes)	
Annotation	The Earth's atmosphere is changing because of industrial emissions polluting the air. The program suggests that this will lead to dramatic changes in world climate, threatening all life. The immediacy of this worldwide problem is brought into focus.	
Price	Contact distributor	
Distributor	ACCESS Network	VC308101

Unit 2: Energy Flows and Cellular Matter

Energy: Science in Focus Series, 1990 [see annotation Biology 20, Unit 1]

Environment: Pathways Through Science Series, 1993 [see annotation Biology 20, Unit 1]

Experiments in Photosynthesis, 1990

Format	Video (18 minutes)
Annotation	In green plants, photosynthesis is the process by which light energy triggers the conversion of water, minerals and carbon dioxide into oxygen and various organic compounds essential to life. This video uses simple experimentation to illustrate the effects of changes in light intensity and carbon dioxide absorption on the ability of green plants to photosynthesize. The experimentation offers a first-hand observation of the intricacies of photosynthetic activity.
Price	$750
Distributor	Marlin Motion Pictures Ltd.

Lawn Herbicides

Format	Factsheet
Annotation	Describes how lawn herbicides work, their uses, restriction on use, environmental hazards, health hazards (abnormal cell growth) and safety precautions.
Price	Free
Distributor	Environment Canada

Light and Energy: Science Show Series, 1989

Format	Video (26 minutes)
Annotation	The primary source of energy on this planet is photosynthesis whereby plants capture the light of the Sun and transform it into energy-rich chemical compounds. The energy stored by plants every year represents ten times humankind's food consumption and corresponds to two hundred times their food requirements. Thus, researchers are trying to harness the energy stored by plants. This program describes techniques to measure photosynthesis as well as current solar energy. Technologies, such as photovoltaic cells, are already available to capture the Sun's energy for human use.
Price	$250
Distributor	Le Groupe Multimédia du Canada

Metabolism: The Fire of Life, 1982

Format	Video (30 minutes)
Annotation	The program illustrates the biochemical process of metabolism upon which all living organisms depend. It explains how the body burns food, how food is converted and stored in the body, the role of key nutrients, all about calories and the basal metabolic rate. Outlines the complex process of cellular respiration.
Price	$145
Distributor	Human Relations Media

Pesticide Education Program, 1991

Format	Kit (5 parts)
Annotation	This resource consists of the following: 1. Forest Tent Caterpillar Study 2. Mosquito Kit 3. Vegetative Management Study 4. Pesticide Education Unit 5. Weed Kit
Price	Free
Distributor	Alberta Environmental Protection

Adaptations—A Struggle for Survival: Bow Summit Edukit, 1981

Format	Video (10 minutes)
Annotation	This program introduces the various ways in which plants adapt to the harsh growing conditions of the alpine and subalpine zones: upturned and waxy needles, strong perennial root growth, large flowers to attract pollinating insects quickly, and mat plants.
Price	Contact distributor
Distributor	ACCESS Network VC224504

Alberta: A Natural History, 1979

Format	Print
Annotation	The whole of the natural history of one province in a single volume. There are studies of rock strata and fossil remains, as well as the flora and fauna of Alberta. The complex interrelationships of organisms, the impact of humankind on the environment and the conservation of natural resources are discussed. This book was distributed to all Alberta school libraries as a result of the Alberta Heritage Learning Resources Projects.
Author	Charles D. Bird et al.
Distributor	Contact school library

Biomes: Aspects of Ecology Series, 1984

Format	Video (29 minutes)
Annotation	Global weather patterns result in a variety of local climates around the world, each with a corresponding formation of vegetation, or biome. The biomes of Alberta are explored.
Price	Contact distributor
Distributor	ACCESS Network VC241805

Biomes: Coniferous Forest, 1989

Format	Video (12 minutes)
Annotation	Of all the major forest biomes, the community with the smallest number of species is the coniferous forest, which forms a belt around the top of North America, Scandinavia and Siberia. This program surveys the flora and fauna common to the coniferous forest biome and explains adaptations and interrelationships among its inhabitants.
Price	$450
Distributor	Coronet Film and Video

Biomes: Desert, 1989

Format	Video (12 minutes)
Annotation	Given the harshness of the desert biome, it is surprising to find how many plants and animals make this their home. Exploring the climatic and geographical reasons for the existence of deserts, this documentary details the unique adaptations of plants and animals to this difficult existence.
Price	$450
Distributor	Coronet Film and Video

Biomes: Grassland, 1989

Format	Video (12 minutes)
Annotation	Located on every continent except Antarctica, grasslands exist wherever there is too little water to support forests but enough to prevent the formation of deserts—a quarter of the Earth's surface is covered by grasslands. How plants and animals adapt, physically and behaviourally, to this biome is shown through journeys in Africa, North America and Australia.
Price	$450
Distributor	Coronet Film and Video

Biomes: Introduction, 1989

Format	Video (12 minutes)
Annotation	A biome is identified as a community of living things occupying a large geographical area—a stable community in which the plants and animals are primarily influenced by their success in adapting to a particular climate. Comparing the physical and environmental characteristics of the six major biomes, this program shows how each is affected by two abiotic factors: light and water.
Price	$450
Distributor	Coronet Film and Video

Biomes: Tropical Rain Forest, 1989

Format	Video (12 minutes)
Annotation	Confined today to areas near the equator, the rain forest is made possible by solar energy and frequent, heavy rains (more than 380 cm per year). By exploring the multitude of life in the tropical rain forest, four distinct layers can be defined that help to explain the great diversity of life.
Price	$450
Distributor	Coronet Film and Video

Biomes: Tundra, 1989

Format	Video (12 minutes)
Annotation	With less than 12 cm of precipitation each year, low temperatures and a short growing season, the tundra forms a belt around the northern polar regions and is home to only a few hardy plants and animals. During the extremely short summer, the tundra becomes the migratory home for a large number of short-term visitors from the coniferous forests to the south. Why this migration happens and how it affects the seasonal cycle of the tundra's permanent residents is examined.
Price	$450
Distributor	Coronet Film and Video

Biosphere (The): Science Now Series, 1989

[see annotation Biology 20, Unit 1]

Blue Collar Bugs (The): The Life Revolution Series, 1991

Format	Video (52 minutes)
Annotation	Genetically engineered organisms may soon be used to clean up pollution from the past, such as the toxic wastes dumped years ago in the Niagara Love Canal. At the same time, new industrial revolutions will be launched by biotechnology. Mining may be free of smelting, fuel may be processed from grains and wood, and food may become unrecognizable, but biotechnology entrepreneurs have yet to overcome the real dangers of environmental disaster caused by the introduction of new species of microorganisms.
Price	$149
Distributor	Magic Lantern Communications Ltd.

Boreal Forest (The), 1993

Format	Video (60 minutes)
Annotation	A group of high school students visit the boreal forest of Alberta to get a first-hand look at the nature of the forest. They examine several biotic and abiotic factors associated with the ecosystem's survival. Concepts, such as succession and interdependence of organisms, are highlighted. The last part of the program addresses forestry issues, such as humankind's impact on the environment, the setting of environmental standards, exploration for resources, native perspectives, sustainable development and development in the forest industry.
Price	Contact distributor
Distributor	FEESA: An Environmental Education Society

Carmanah Forever: Parks and Wilderness Package, Module 1, 1988

Format	Video (25 minutes)
Annotation	Portrays grassroots action taken by conservationists in British Columbia to protect one of the last old-growth forests. This Sitka spruce forest has been growing for 10 000 years, undisturbed, but is now the site of planned clear-cutting activities.
Price	$399 (module price includes 5-video package)
Distributor	Education Through Video Ltd.

Circles and Cycles: Aspects of Ecology Series, 1984

Format	Video (28 minutes)
Annotation	This video examines the flow of energy through photosynthesis, food chains and food webs; and the flow of matter through the carbon and water cycles. Scientists discuss the greenhouse effect, the effect of pesticides, and water diversion.
Price	Contact distributor
Distributor	ACCESS Network VC241801

Climate for Growth (A): Bow Summit Edukit, 1981

Format	Video (10 minutes)
Annotation	The interaction of several factors have a profound effect on the climate of the Bow Summit area. The program explains: prevailing winds, cooler temperatures, thin air and higher altitudes, ultraviolet radiation and the formation of soil.
Price	Contact distributor
Distributor	ACCESS Network VC224502

Darwin, Naturally: Organic Evolution Series, 1986

Format	Video (10 minutes)
Annotation	Charles Darwin theorized that nature imitates the selective hand of humans in controlling variation within a species. He coined the phrase "natural selection" to explain how variations within species are preserved or rejected.
Price	Contact distributor
Distributor	ACCESS Network VC289502

Ecology and Conservation: Parks and Wilderness Package, Module 1, 1984

Format	Video (18 minutes)
Annotation	A wetland in England is the focus of a discussion surrounding problems associated with the question of how to maintain a marsh in its present condition, which would otherwise be subject to change naturally brought about by succession.
Price	$399 (module price includes 5-video package)
Distributor	Education Through Video Ltd.

Ecosystems: Aspects of Ecology Series, 1984

Format	Video (29 minutes)
Annotation	Ecosystems are defined as the flow of energy; stability; abiotic and biotic factors; and relationships among organisms, such as commensalism. The effects of the hyrologic cycle and acid rain on ecosystems are also discussed.
Price	Contact distributor
Distributor	ACCESS Network VC241802

Ecosystems of the Great Land Series, 1987

Format	Video (15 minutes each)
Annotation	**Coastal Forest Ecosystem (The)**—For 1450 kilometres, from Canada to the Kodiak Islands, high mountains drop to the sea. The program examines the water cycle of this region, which has up to 560 cm of rainfall in a season, with a temperature range from 0° to the teens. It explains the difference between old and new growth forest and takes a look at coastal forest animals, such as martens, minks, otters, foxes, wolves, black bears and grizzlies. **Introduction to Ecosystems**—This program introduces general ecological concepts, the role of the Sun, photosynthesis, and the web of life. It briefly describes the four major Alaskan ecosystems: the tundra, with lichens and small bushes, but no trees; the more populated and better watered taiga, or boreal forest; the coastal forest with its rivers and bogs; and the oceans surrounding Alaska. **Man's Impact on the Environment**—Salmon and caribou sustained the human population in the tundra for centuries. But now the human population threatens to damage the ecosystem in which these species exist. In the taiga, where most people live, fire and floods are common hazards. Roads, railroads and agricultural land are problems for animals. The coastal forests recover best from human intervention because they receive the most energy from the Sun. Pollution has damaged the oceans; lead has been discovered in halibut. The program emphasizes that each ecosystem is fragile and needs special attention to keep its natural balance. **Ocean Ecosystem (The)**—The oceans are a source of weather changes and moisture for much of the world, they are larger and contain more living things than does the land. Ninety per cent of all marine life is found on the continental shelf. Microscopic plankton, which synthesize half the world's oxygen, exist in the top 8 cm of the water. The program also documents the life cycle of Pacific salmon and their role, along with other ocean life, in the food chain. **Taiga Ecosystem (The)**—The taiga begins at the tree line. Closer to the water, it has a dry, cold climate, with less extreme temperature variation than in the tundra. Bogs are common. The risk of forest fires and their role in plant succession is examined. The program illustrates the life cycle of the white spruce from germination to succession. The concepts of carrying capacity and predator–prey relationships are illustrated, using the lynx and hare, and the fox and lemming as examples. **Tundra Ecosystem (The)**—Covering vast tracts of Alaska, the arctic tundra in the valleys and plains and the alpine tundra in the mountains support only a limited amount of life because of lack of moisture, dry winds and little light. Trees do not grow here, and flowers take up to 20 years to bloom. Because shrubs and grasses only 5 cm tall may be 50 years old, damage takes a long time to repair. Native people as well as tundra animals are featured in the program.
Price	\$175 each \$795 for 6 programs
Distributor	Kinetic Inc.

Energy and the Food Web: Science in Focus Series, 1991

Format	Video (20 minutes)
Annotation	Energy is the power by which anything acts. All life forms make up the food web. Can the energy flowing into and through the web be measured? From solar energy to plants as primary producers, different sources of energy and energy measuring methods are examined. Example questions addressed are: How much energy is stored in a leaf? Does energy ever leave the biomass, and if so, how?
Price	$320
Distributor	T. H. A. Media Distributors

Forests, 1990

Format	Video (26 minutes)
Annotation	Abiotic and biotic factors influence aquatic and terrestrial ecosystems. This program examines the interaction of plants and animals as each contributes to the forest ecosystem. The impact of humankind on forests, and the use of technology to solve the problems of deforestation, is also addressed.
Price	$150
Distributor	Le Groupe Multimédia du Canada

Form and Function of Fossils: The Earth Explored Series, 1987

Format	Video (27 minutes)
Annotation	The program describes how geologists reconstruct the life habits of a particular fossil by examining the physical evidence. It shows the different ways in which paleontologists determine the swimming capabilities of extinct animals, using homology with living relatives, analogy with unrelated but similar organisms, or by using experimental models and paleontological information, such as a Mosasaur's tooth marks.
Price	Contact distributor
Distributor	ACCESS Network VC279802

Fragile Soil (The): Earth Series, 1988

Format	Video (20 minutes)
Annotation	This program looks at some of the ways in which people and technology affect the soil. The fertility of the soil is essential to support the vegetation that grows from it and which, in turn, supports other life forms. This ecosystem's fertility depends on the balance of its abiotic and biotic factors. But this balance is threatened to a large degree by modern methods of agriculture.
Price	$300
Distributor	T. H. A. Media Distributors

In the Beginning: Organic Evolution Series, 1986

Format	Video (10 minutes)
Annotation	Although creationism was widely accepted in the eighteenth century, several scientists challenged this model and laid the groundwork for the theory of organic evolution. This program examines the contributions of pioneers Carl Linnaeus, le Comte de Buffon and Jean Lamarck to the evolution theory.
Price	Contact distributor
Distributor	ACCESS Network VC289501

Life in the Balance: The Interdependence of Species and Ecosystems: The Infinite Voyage Series, 1991

Format	Video (60 minutes)
Annotation	This video shows the many ways in which humans of the twentieth century are altering the Earth's evolution—not only for plants, mammals and marine life, but for themselves as well. Study guide included.
Price	$249
Distributor	New Vision Media

Microcosmos Coloring Book (The), 1988

Format	Print	ISBN 0156594307
Annotation	This colouring book is an introduction to the microbial world, its inhabitants and their environments. It contains 100 illustrations of microscopic organisms found in such different settings as forests, deserts, ponds, oceans and the human body. Each facing page contains a reduced version of the illustration labelling the detailed structures of the organisms. A glossary of terms is included.	
Price	$14.95	
Author	Lynn Margulis and Dorion Sagan	
Distributor	Harcourt Brace and Company Canada	

Micro-organisms (The): Aspects of Ecology Series, 1984

Format	Video (29 minutes)	
Annotation	Presents a brief history of microbiology. Explores the microbiology of a freshwater stream, soil microbiology nitrogen fixation, oil-eating bacteria, and giardiasis, an intestinal illness caused by a microscopic parasite.	
Price	Contact distributor	
Distributor	ACCESS Network	VC241804

New Leaf (A): Real Sustainability for the Boreal Forest, 1993

Format	Video (55 minutes)
Annotation	The program is divided into three parts. The first part addresses the idea of promoting tourism in Alberta's boreal forest because of the profusion of wildlife. The second part suggests that clear cut logging and current pulp mills are not environmentally sustainable in the long run. Alternatives to these procedures are shown. The third part of the program dispels the myth that one has to choose between jobs and the environment.
Price	Contact distributor
Distributor	Western Canada Wilderness Committee

Origins of Change: DNA and the Evidence for Evolution: The Evolution Series, 1985

Format	Video (20 minutes)
Annotation	This program shows the structure and replicating processes of DNA and the effects of genetic mutation. It also demonstrates the Lederberg experiment, and summarizes the evidence provided by fossils and structural and biological homologies to support the view that the process of adaptation and the selection of adapters is dependent on a wide range of genetic variability.
Price	$139 U.S.
Distributor	Films for the Humanities and Sciences

Patterns—A Mountain Patchwork: Bow Summit Edukit, 1981

Format	Video (9 minutes)	
Annotation	This program illustrates how vegetation patterns are determined by landscape and climate. The three distinct zones of vegetation on Bow Summit are presented: the subalpine on the lower slopes, the alpine on the higher slopes, and the tree line where the two zones converge.	
Price	Contact distributor	
Distributor	ACCESS Network	VC224503

PCBs in the Food Chain, 1990

Format	Video (18 minutes)
Annotation	Shown are the effects of marine pollution, absorbed by the tiniest plankton, and passed up the food chain, poisoning organisms who feed upon them. Due to biomagnification, dolphin blubber shows traces of polychlorinated biphenyls (PCBs) in concentrations 100 000 times greater than the seas in which the dolphins live. The toxins are long-lived, difficult to destroy and accumulate in body tissue.
Price	$139 U.S.
Distributor	Films for the Humanities and Sciences

Populations: Aspects of Ecology Series, 1984

Format	Video (29 minutes)	
Annotation	This video explains the significance of population studies and explores the concepts of dispersal, density, limiting factors, "S" and "J" shaped curves, and the roles of natality, mortality and migration. These concepts are illustrated through an examination of certain plant and animal studies conducted by Alberta biologists.	
Price	Contact distributor	
Distributor	ACCESS Network	VC241803

Science, Technology and Society, 1992

[also for Biology 30, Unit 2 and Unit 3]

Format	Print	ISBN 0748712933
Annotation	A resource pack with a wide range of topics, exercises and assignments on current issues in environmental science, human biology, and other general science areas. All of the units address issues through up-to-date information with illustrations and statistics. Recent scientific advances are investigated through real-life case studies. British examples are used in the discussion of some science issues.	
Price	$77.20	
Author	David Andrews	
Distributor	Copp Clark Pitman Ltd.	

Shores of Life (The), 1990

Format	Video (28 minutes)
Annotation	Between the dry land habitats of New Brunswick, Prince Edward Island and Nova Scotia, and the salt water of the Atlantic, there is a vital band of wetland habitats. The shores are influenced by the sea and the land, creating ecological systems more diverse and more productive than either land or sea. This video explores the biological wealth of these Atlantic coastal wetlands, from the microbes of salt marsh tidepools, beachcombing sandpipers and the bald eagles of Bras d'Or to the human harvest of fish and waterfowl. A separate, companion film, *Touched by the Tide*, looks at the wetlands influenced by giant tides in the Bay of Fundy. These videos could be useful in addressing science-technology-society connections.
Price	Free on loan
Distributor	Ducks Unlimited Canada

Weeds of the Prairie, 1985

Format	Print
Annotation	Learn to identify 93 common weeds. Get to know where they tend to grow, what features can be used to make a positive identification, and why each weed is of agricultural concern. This book features colour photos and illustrations of whole mature plants, seedlings, seeds and flowers.
Price	$15
Distributor	Alberta Agriculture, Food and Rural Development

Bodyguard Dreams and Realities: Mind and Body Series, 1989

Format	Video (55 minutes)
Annotation	This is a documentary on the immune system. Scientists and researchers provide an update on the latest developments in the fight against AIDS, as well as other areas, such as cancer, diabetes, allergies and organ transplants.
Price	$550
Distributor	McNabb and Connolly Films

Bodywise: Pathways Through Science Series, 1992

Format	Print	ISBN 0582094054
Annotation	This module contains strategies and activities dealing with health, disease and function of the human body. Examples of some of the investigations are enzymes and digestion, kidney failure, heart disease and body defences. A commentary is cross-referenced to the activities and provides background information and sample results of experiments. A source book contains science-technology-society connections related to human health, body functions and physical fitness. A study guide outlines main ideas for review. Some of the examples used have a British context.	
Price	$69.56	
Distributor	Copp Clark Pitman Ltd.	

Circulation of the Blood, 1987

Format	Video (14 minutes)
Annotation	Animated diagrams are used in this study of the systemic and pulmonary circulation of the blood in the human body. Illustrated are the structure and function of the heart, lungs, arteries, veins and capillary network, with views of the heart cycle and the oxygen/carbon dioxide exchange in the cells and air sacs of the lungs.
Price	$394
Distributor	Marlin Motion Pictures Ltd.

Circulation of the Blood, 1990

Format	Video (24 minutes)
Annotation	The human body requires a constant supply of oxygen and nutrients to its billions of cells, and the constant removal of carbon dioxide and water. These tasks are performed by the blood. Animation is used to illustrate the circulatory system. The program explains the function of each part of the heart, shows how matter is exchanged in the cells, and illustrates how the nervous system regulates heartbeat.
Price	$49.95
Distributor	Canadian Learning Company

Circulatory and Respiratory Systems: The Human Body Series, 1988

Format	Video (18 minutes)
Annotation	The circulatory system includes the blood, arteries, veins, capillaries, and the powerful four-chambered heart. Closely allied with the circulatory system is the respiratory system, powered by the lungs. Here, carbon dioxide is exchanged for oxygen. A detailed discussion of pulmonary and systemic circulation is given.
Price	Contact distributor
Distributor	National Geographic Educational Services

Controlling Pain: Science Show Series, 1990

Format	Video (26 minutes)
Annotation	How and why does pain occur? This program describes the complex process of pain, which originates either from specialized skin receptors or from the brain. Researchers are attempting to find new ways to alleviate pain. Among the findings, chemical pain killing drugs and new electric stimulation techniques.
Price	$150
Distributor	Le Groupe Multimédia du Canada

Coping with Change: Homeostasis Series, 1990

Format	Video (10 minutes)
Annotation	This program is an introduction to the concept of homeostasis. Using the example of changing temperature in the external environment, and the human bodies' internal responses, the program illustrates one way the process of homeostasis maintains a relatively balanced internal condition.
Price	Contact distributor
Distributor	ACCESS Network

Digestion: Chemical Changes, 1987

Format	Video (16 minutes)
Annotation	Animated diagrams demonstrate the chief changes involved in the chemical breakdown of carbohydrates, proteins and fats within the digestive system. The program shows the secretion of intestinal bile and pancreatic juices, and their action on digested foods. Following the absorption of nutrients through the villi, the blood carries the products of digestion to the cells of the body where cellular respiration takes place.
Price	$457
Distributor	Marlin Motion Pictures Ltd.

Education About AIDS for Secondary Teachers, 1988

Format	Video (29 minutes)
Annotation	Teaching strategies are demonstrated, and available resources are highlighted for secondary teachers of AIDS education. To make use of this information, teachers are encouraged to find out about the level of AIDS awareness of students and then focus on aspects that need attention.
Price	Contact distributor
Distributor	ACCESS Network VC707502

Excretory System: The Human Body Series, 1980

Format	Video (14 minutes)
Annotation	The transformations of matter and energy in metabolism produces wastes, which are removed from the body by the excretory system. Animation is used to show how blood transports wastes from the cells and how the lungs, kidneys and skin remove carbon dioxide and heat from the blood.
Price	$450
Distributor	Coronet Film and Video

External Respiration, 1987

Format	Video (14 minutes)
Annotation	Animated diagrams offer a close-up view on the structure and function of the nasal passages, trachea, thorax and lungs. The program shows the movement of the diaphragm and thorax during inspiration and expiration. It illustrates the structure and function of the air sacs, along with the gaseous interchange between the blood and the air in the lungs. There is also a brief account of the expulsion of surplus carbon dioxide during expiration.
Price	$263
Distributor	Marlin Motion Pictures Ltd.

Human Digestive System, 1990

Format	Video (18 minutes)
Annotation	The program describes how energy can be derived from food. But before this can happen, food must be digested by the body so that all useful nutrients can be absorbed. With endoscopic pictures, diagrams, photomicrographs and laboratory experiments, this program shows how the human digestive system works. It documents the process from the time food passes down the esophagus through to the undigested residue in the large intestine. Specific names of digestive enzymes are not emphasized.
Price	$49.95
Distributor	Canadian Learning Company

Immune System (The): Science Show Series, 1990

Format	Video (26 minutes)
Annotation	An army of cells is constantly on the alert in the human body. Its mission is to destroy any foreign cells, viruses or bacteria that might invade the body. This program uses imagery to describe the battles waged by the immune system, show how defences are set up against viral invasion, and how, through vaccination, the immune system is controlled. Cyclosporine, an antirejection drug, works to prevent the immune system from going into action, as in the case of organ transplants.
Price	$250
Distributor	Le Groupe Multimédia du Canada

Life Under Pressure, 1991

Format	Video (26 minutes)
Annotation	This program follows the journey of a red blood cell through the circulatory system as it delivers oxygen and nutrients to all parts of the body and removes wastes. It shows how the arteries and veins are structured: arteries to transport blood to all the cells, and veins to return blood to the heart.
Price	$149 U.S.
Distributor	Films for the Humanities and Sciences

Membranes and Transport: Biology Form and Function Series, 1991

Format	Video (24 minutes)
Annotation	Concentrating on how the various membrane systems work, this program examines the cell's ability to selectively transport a wide variety of substances into and out of cells. All of this transportation is highly specific, ensuring that each substance is delivered to the target organs. This program shows the way in which the membrane obtains macromolecules, how it attempts to prevent the entrance of foreign invaders, and how those foreign invaders try to overcome the cell's defense system.
Price	$750
Distributor	Marlin Motion Pictures Ltd.

Michael Brown and Joseph Goldstein: Nobel Prize Series, 1990

Format	Video (20 minutes)
Annotation	This video is accompanied by a student notebook and a teacher resource book. Brown and Goldstein, and their work, are introduced through brief interviews and scenes from their public and private lives. They shared the 1985 Nobel Prize in medicine for their explanation of how mammal cells use and metabolize cholesterol. Their work can help others to develop improved methods for screening people for potential cardiovascular problems and possibly to help them solve some of those problems.
Price	$69
Distributor	Sunburst Communications Inc.

Osmoregulation: Homeostasis Series, 1984

Format	Video (10 minutes)
Annotation	An exploration of the process of osmoregulation, using as an example the complex filtering process that takes place in the kidneys.
Price	Contact distributor
Distributor	ACCESS Network VC226403

Our Immune System: The Human Body Series, 1988

Format	Video (26 minutes)
Annotation	Each of us has millions of invisible enemies—viruses, bacteria, parasites; but the body's defences are complex and powerful. This film examines challenges to the immune system and how scientists are discovering new ways of assisting the immune system.
Price	Contact distributor
Distributor	National Geographic Educational Services

River of Life: A Resource Unit on Blood, Circulation and Lymphatics, 1987

Format	Print
Annotation	Covers basic anatomy and physiology of the circulatory system and applications of these principles to human social, medical and technological concerns.
Price	Contact distributor
Distributor	Canadian Red Cross Society

Source Book for Health Education Materials and Community Programs, 1991

Format	Print
Annotation	A booklet of health education materials and community programs offered by the Heart and Stroke Foundation of Alberta. It features information about the causes of heart failure and stroke, and guidelines for their prevention.
Price	Contact distributor
Distributor	Heart and Stroke Foundation of Alberta

Susumu Tonegawa: Keys to the Immune System: Nobel Prize Series, 1990

Format	Video (15 minutes)
Annotation	This program includes an interview with Tonegawa, a student notebook previewing his life and research, and a teacher resource book. One of the basic theories of biology holds that DNA provides the blueprints for protein molecules—one gene provides the blueprint for one, and only one, protein molecule. Information about the structure of proteins flows from DNA to the molecule and never the other way around. Some of the molecules produced this way are used to build cells. Others are enzymes, which control the body's chemical processes. Tonegawa studied antibodies, components of the immune system that combine with a virus or bacteria and render it harmless.
Price	$69
Distributor	Sunburst Communications Inc.

Transplant Immunology: Women in Science Series, 1990

Format	Video (28 minutes)
Annotation	This is a career-oriented video in the area of transplant immunology. It may be useful for introducing science–technology–society connections. Patricia Bakkestad-Legare is a medical technologist who does the tissue typing that confirms or disproves the compatibility of donor and recipient tissue. She employs the latest technology for immunological matching and control. Dr. Rachel McKenna is Patricia's supervisor. She controls the operation of the laboratory, separating herself from the practical hands-on activity in deference to the administrative demands of finding the funding to support the lab's endeavours.
Price	$99
Distributor	Magic Lantern Communications Ltd.

What Everyone Should Know About Food Safety, 1990

Format	Print
Annotation	Includes information about disease-causing microbes, understanding chemicals, pesticides, facts about organic drugs such as antibiotics, and hormones.
Price	Contact distributor
Distributor	Agriculture Canada

Other Learning Resources: Biology 30

The resources identified below have not been evaluated by Alberta Education. These listings are not to be construed as an explicit or implicit departmental approval for use. They are provided as a service only to assist school authorities to identify resources that contain potentially useful ideas. The responsibility to evaluate these resources prior to selection rests with the user, in accordance with any existing local policy.

Note: Prices of resources are listed as provided by distributors, May 1993. Check with distributor for current rates.

Unit 1: Systems Regulating Change in Human Organisms

Blood Sugar Regulation and Diabetes: Biology Form and Function Series, 1990

Format	Video (24 minutes)
Annotation	This program introduces two diabetics and follows their activities during the course of a normal day to demonstrate how an effective control of blood sugar must take into account diet, working patterns and lifestyles. Two separate case studies are examined in order to explain insulin dependent and noninsulin dependent diabetes and the varying treatments of the disease.
Price	$750
Distributor	Marlin Motion Pictures Ltd.

Chemistry of Life: Hormones and the Endocrine System, 1981

Format	Video Part 1: 19 minutes Part 2: 19 minutes Part 3: 15 minutes
Annotation	The main objectives of this program are to: • introduce the functions of the endocrine system • explain the roles of the major endocrine glands • describe how hormones shape physical and mental development • survey current research in the endocrine field • explore the link between the endocrine system and the nervous system, with special emphasis on the brain • discuss mental and physical disorders caused by hormones.
Price	Contact distributor
Distributor	Human Relations Media

Endocrine System: The Human Body Series, 1980

Format	Video (16 minutes)
Annotation	Coordinating the activities of the body's trillions of cells is the function of the endocrine system. Animation is used to show how the major glands of this system—the pituitary, thyroid, parathyroid, pancreas, adrenals, testes and the ovaries—release their hormones directly into the bloodstream and coordinate all of the body's basic internal homeostatic activities.
Price	$450
Distributor	Coronet Film and Video

Messengers: The Living Body: The Circulatory System Series, 1991

Format	Video (26 minutes)
Annotation	The delicate interplay of hormones is responsible for all the events of reproduction. Other examples of how body processes are controlled and coordinated by hormones are illustrated in this program, including the "fight or flight" reaction.
Price	$149 U.S.
Distributor	Films for the Humanities and Sciences

Nervous System: The Human Body Series, 1988

Format	Video (18 minutes)
Annotation	Provides a look at the function of the nervous system that moderates the activities of the body's complex processes and links it to the external environment.
Price	Contact distributor
Distributor	National Geographic Educational Services

Vision and Movement: The Brain Series, 1984

Format	Video (60 minutes)
Annotation	With an appearance by champion diver Greg Louganis and Nobel winners Hubel and Weisel, this program explains how the human brain coordinates body movement and activity and aids our perception of the world.
Price	Contact distributor
Distributor	Visual Education Centre

Unit 2: Reproduction and Development

Bodyguard: Sexually Transmitted Diseases and AIDS: Bodyguard Series, 1990

Format	Video (26 minutes)
Annotation	Uses experts in the field of sexually transmitted diseases to explain chlamydia, gonorrhea, syphillis and AIDS. Set in contrast to the scientific explanations are the human stories told by those affected by AIDS. Discretion is advised. Ideally, the material should be previewed prior to presentation.
Price	$250
Distributor	McNabb and Connolly Films

Million Teenagers (A), Fifth Edition, 1991

Format	Video (25 minutes)
Annotation	Two peer counsellors talk about sexually transmitted diseases with a high school class, giving information and fielding questions. The program discusses gonorrhea, chlamydia, herpes and syphillis, as well as presenting information on AIDS. It explains the physiology of the diseases, their transmission, symptoms and treatment.
Price	$480
Distributor	McIntyre Media Limited

Miracle of Life (The): Interactive NOVA, 1991

Format	Videodisc ISBN 0590850288
Annotation	This videodisc can be used to explore a wide variety of topics in human reproduction, such as female and male reproductive systems, egg and sperm development, fertilization, fetal development and birth. The issues of reproductive technologies, birth control, and sexually transmitted diseases are discussed. Includes an interactive multimedia activity on prenatal care. Components: 1 videodisc (12"), 5 discs (Macintosh 3.5"), teacher's guide, handbook and instructions. Needed to use *Interactive NOVA*: • Macintosh computer with a 20 megabyte or larger hard disc • videodisc player Pioneer 2200, 4200, 6000A, 6010A or 8000; Sony 1200, 1450, 1500 or 1550 • colour video monitor (composite type) • RS–232 cable to connect videodisc player and Macintosh.
Price	$495 U.S.
Distributor	Scholastic Software—TAB Publication Ltd.

Science, Technology and Society, 1992 [see annotation Biology 20, Unit 3]

Unit 3: Cells, Chromosomes and DNA

All in the Family: The Life Revolution Series, 1991

Format	Video (52 minutes)
Annotation	A look at genetically inherited diseases: 12-year-old Shannon has cystic fibrosis, her fraternal twin sister does not. Shannon may be saved from premature death by the international effort among scientists to locate the cystic fibrosis gene. A 47-year-old mother of four is able to determine whether or not she is genetically predisposed to Huntington's disease by taking a screening test engineered by biotechnologists.
Price	$149
Distributor	Magic Lantern Communications Ltd.

Amniocentesis for Prenatal Testing, 1991

Format	Video (12 minutes)
Annotation	This program explains amniocentesis procedures, possible risks and results, and answers most commonly asked questions.
Price	$200
Distributor	McIntyre Media Limited

Biochemistry: The World of Chemistry Series, 1990

Format	Video
Annotation	Describes protein structure, protein synthesis, the role of enzymes and DNA.
Price	$59
Distributor	Magic Lantern Communications Ltd.

Cancer: A Genetic Disease, 1988

Format	Video (25 minutes)
Annotation	Genes are implicated in cancer and the way they are expressed can lead to malignancy. At the same time, factors in the environment and individual lifestyles can also contribute to the risk of developing cancer. By looking at research in North America, Britain and Japan, this program examines how genes and other environmental factors are linked to carcinogenesis.
Price	$450
Distributor	Coronet Film and Video

Delicate Balance: Human Health Through Biotechnology, 1988

Format	Video (28 minutes)
Annotation	An explanation of the process of recombinant DNA and monoclonal antibody techniques is given. Scientists explain recent biotechnology advances affecting human health care.
Price	$49.95
Distributor	Canadian Learning Company

Gene Machine (The), 1991

Format	Video (26 minutes)
Annotation	This program explains DNA and the Human Genome Project, which proposes to read and map each of the three billion links thought to make up the human genome. The program has interviews with scientists and introduces four generations of a family to illustrate how genes influence family traits. It also shows how advances in molecular technology are helping to unravel the human genetic code.
Price	$149 U.S.
Distributor	Films for the Humanities and Sciences

Genes and Hereditary Disorders, 1989

Format	Video (22 minutes)
Annotation	The program examines the links between genes and diseases, such as cystic fibrosis and Down's syndrome. With the aid of animation, a genetic counsellor describes how dominant and recessive genes, family and ethnic background and environmental influences can affect fetal development. Genetic counsellors discuss the following issues: amniocentesis, ultrasound examinations and family planning.
Price	$480
Distributor	McIntyre Media Limited

Genetic Code (The): The World of Chemistry Series, 1989

Format	Video (28 minutes)
Annotation	Examines how the body manufactures the proteins required to sustain life, and how genetic characteristics are passed from generation to generation.
Price	$99
Distributor	Magic Lantern Communications Ltd.

Genetic Engineering and Protein Synthesis, 1987

Format	Video (27 minutes)
Annotation	One of the fastest growing science fields is genetic engineering. Animation and live photography are used to explain the process of protein synthesis. The program shows how a bacteriophage infects a bacterium by injecting its DNA into a bacterium. The bacteriophage takes over the bacterium's biochemistry, the viral DNA is copied onto a messenger RNA, which then carries the genetic information to ribosomes. Transfer RNA molecules then translate the genetic code and assemble chains of amino acids to form proteins, creating more bacteriophages.
Price	$865
Distributor	Marlin Motion Pictures Ltd.

Genetic and Plant Improvements, 1991

Format	Video (15 minutes)
Annotation	Imagine fruits and vegetables resistant to pests; trees that mature in just a few years; and cereal grains that have high yields. All these plant improvements are possible as a result of genetic studies and engineering. This program leads the viewer through a study of plants, how they reproduce, and how scientists are using their knowledge of genetics to improve many plant characteristics and crop productivity.
Price	$500
Distributor	Marlin Motion Pictures Ltd.

Genetics: Science Show Series, 1990

Format	Video (26 minutes)
Annotation	When it was discovered that genes served as data banks for cells, geneticists began to unravel the DNA molecule and the field of genetic engineering enabled scientists to create new plant and animal species. This program not only examines the scientific breakthroughs of genetic engineering but also explores its medical and ethical repercussions.
Price	$250
Distributor	Le Groupe Multimédia du Canada

Geometry of Life (The): Exploring DNA and the Double Helix: The Infinite Voyage Series, 1991

Format	Video (60 minutes)
Annotation	In the strands of DNA, the mysteries of life unfold. Researchers now know that DNA is a life-shaping structure, and they are using it to study evolution, inherited diseases and the complex biochemistry of living organisms. A study guide emphasizing major concepts is included.
Price	$249
Distributor	New Vision Media

Great Gene Robbery (The): Turning the Tide Series, 1988

Format	Video (26 minutes)
Annotation	Within a hundred years it is predicted that, at current rates, one third of all the globe's plant species will be driven to extinction. Lost with those species may be the opportunity to find new food crops, medicines to fight disease, and chemicals to fight pests. In the Andes, it is found that wild relatives of the potato are threatened. So far, genetic engineering is limited in its ability to protect food crops.
Price	$350
Distributor	McNabb and Connelly Films

Meiosis: The Key to Genetic Diversity, 1990

Format	Video (30 minutes)
Annotation	This program shows why meiosis is important to sexually reproducing organisms. Part one shows how an organism's sex cells are formed through the process of meiosis. Using computerized animation and graphics, each step of meiosis is portrayed, from prophase I through telophase II. Part two explains how the random segregation of chromosomes during meiosis contributes to genetic diversity, and why genetic diversity is important in strengthening a species.
Price	$49.95
Distributor	Canadian Learning Company

Meiosis: The Key to Genetic Diversity, 1991

Format	Video (26 minutes)
Annotation	This program illustrates—with the help of computer animation and graphics—why meiosis is important to sexually reproducing organisms. It shows, step by step, how an organism's sex cells are formed through the process of meiosis. The video also explains why genetic diversity is important, and how it strengthens a species.
Price	$189
Distributor	Human Relations Media

Meiotic Mix (The): Organic Evolution Series, 1986

Format	Video (10 minutes)
Annotation	Illustrates the difference between mitosis, an asexual mode of reproduction, and the "chromosomal dance" that occurs during meiosis, with the significance of both to organic evolution. The random segregation and crossover of genes among chromosomes during meiosis is shown to generate variation.
Price	Contact distributor
Distributor	ACCESS Network VC289504

Mitosis and Genetics: The Cell Series, 1990

Format	Video (16 minutes)
Annotation	An explanation is given of mitosis, the process by which genetic information is passed from cell to cell during cell division. Time-lapse photography reveals how chromosomes, genes and DNA behave in the nucleus during each phase of mitosis.
Price	Contact distributor
Distributor	Visual Education Centre

Muscular Dystrophy: Race for the Gene, 1988

Format	Video (50 minutes)
Annotation	Expert, Dr. Martin-Bobrow, explains how the site of the gene on the X chromosome has been identified, and how this information is being used to develop methods for the detection of gene carriers of muscular dystrophy—a discovery that has given hope that a cure for the disease may be within sight.
Price	$450
Distributor	Coronet Film and Video

Mutation and All That: Organic Evolution Series, 1986

Format	Video
Annotation	Although the mechanism of meiosis constantly reshuffles the gene pool of a population, it is believed that only mutation can dramatically change the genotype and phenotype of a species. Examining the structure of DNA and the alteration of the genetic code, the relation of mutation to the rate of evolution is debated.
Price	Contact distributor
Distributor	ACCESS Network VC289506

Nucleus (The): Cell Biology Series, 1988

Format	Video (15 minutes)
Annotation	The cell nucleus is a complex structure that protects chromosomes, receives regulatory messages from the cytoplasm, and sends instructions for building enzymes and other proteins to ribosomes. The program introduces the structure and function of the nucleus, the DNA molecule and protein synthesis, DNA replication prior to mitosis, and mitosis and cell division.
Price	$450
Distributor	Coronet Film and Video

Of the Earth: Agriculture and the New Biology, 1986

Format	Video (28 minutes)
Annotation	The program features an overview of biotechnology and its applications to agricultural research and crop development. It illustrates how beneficial microbe and crop plants are engineered and how scientific endeavours can be applied to field work. The examples relate to science-technology-society connections.
Price	$49.95
Distributor	Canadian Learning Company

Pandora's Box: The Life Revolution Series, 1989

Format	Video (52 minutes)
Annotation	What will be the consequences of opening the biotechnology box? Biotechnology can be used for many purposes, including the creation or preservation of a species. This program examines related moral dilemmas and concludes that biotechnology, like Pandora's box, is a source of both ills and hope for the future.
Price	$149
Distributor	Magic Lantern Communications Ltd.

Patterns of Diversity: Genetics Series, 1988

Format	Video (25 minutes)
Annotation	Evolution—the adaptation of an animal to its surroundings over geological time—is still an area of controversy a century after the introduction of the theory of natural selection. Is evolution associated with random molecular drift of individual proteins in an organism, or is it a response to changes in the environment? How are such changes incorporated in genetic materials? These are the questions examined in the program.
Price	$450
Distributor	Coronet Film and Video

Projecting Visions: Developmental Biology Series, 1990

Format	Video (24 minutes)
Annotation	The program gives an overview of the problems and latest research involved in nerve regeneration. Photomicrography and narration examine what determines cell uniqueness, how cells know where to migrate for repair, and why the initiation of nerve fibre regrowth is a much more difficult problem than is that of the connecting of nerves.
Price	$450
Distributor	Coronet Film and Video

Rare Breeds: The Nature of Things Series, 1989

Format	Video (30 minutes)
Annotation	Rare species of wild animals are not the only ones facing extinction, even farm animals are at risk, especially those bred for a specific purpose and reared on high-technology farms. But farm animal conservationists see an important role for these hardy breeds in today's diverse economic markets and rapidly changing global environment.
Price	$109
Distributor	CBC Educational Sales

Science, Technology and Society, 1992 [see annotation Biology 20, Unit 3]

Secrets of Life: The Life Revolution Series, 1991

Format	Video (52 minutes)
Annotation	The program introduces a brief history of genetic science from Darwin's theory of evolution through to the discovery of DNA and the invention of gene splicing. The program features interviews with James Watson, the man who unravelled the secret of DNA's structure; and Stanley Cohen, the man who first spliced the gene and created contemporary cloning techniques. Computer animation illustrates the composition of the DNA molecule, and reveals how the gene was spliced. The program concludes with the story of the early boom in the biotechnology business, when billions of dollars were raised in the hope that a cure for cancer had finally been found.
Price	$149
Distributor	Magic Lantern Communications Ltd.

Translating the Code: Protein Synthesis, 1990

Format	Video (30 minutes)
Annotation	How does DNA control production of all the proteins the body needs? How can a code consisting of only four different bases in the DNA direct the synthesis of so many diverse proteins? These are some of the questions explored in this two-part program. Part one discusses that one gene codes for one protein and that genetic information always flows in one direction, from DNA to RNA to protein. Part two discusses how Nobel Laureate, Susuma Tonegawa, examined a problem about the immune system that had long puzzled researchers: how to explain the fact that the body can make more antibody proteins than there are in genes.
Price	$49.95
Distributor	Canadian Learning Company

Translating the Code: Protein Synthesis, 1991

Format	Video (27 minutes)
Annotation	Computer graphics and animation clarify the various steps of protein synthesis. The program also looks at challenges to biology's central dogma, which holds that one gene codes for one protein and that genetic information always flows in one direction—from DNA to RNA to protein.
Price	$189
Distributor	Human Relations Media

Web of Life (The), 1990

Format	Video (60 minutes)
Annotation	This program considers the human quest to understand and control the genetic basis of life. It explores the ethical questions faced by humans as they confront the capabilities of biotechnology. Scientists, historians, social analysts and a philosopher/poet consider the origins, myths and potential of humankind's attempts to reshape its biological legacy.
Price	Contact distributor
Distributor	Visual Education Centre

Wheat: A New Breed: Genetics Series, 1987

Format	Video (25 minutes)
Annotation	The challenge of producing new crop varieties has turned modern cereal breeding programs into large-scale field experiments. Wheat breeders are combining traditional and modern approaches in their search for high yielding crops for the future. Crop scientists discuss the successes and problems facing future wheat breeders.
Price	$450
Distributor	Coronet Film and Video

Factoring in Mendel: Organic Evolution Series, 1986

Format	Video (10 minutes)
Annotation	Darwin was unable to explain how characteristics are transferred from generation to generation. The solution is found in Gregor Mendel's experiments with the common pea plant. The program examines dominant and recessive traits and the Hardy-Weinberg law.
Price	Contact distributor
Distributor	ACCESS Network VC289503

Population Picture (The): Organic Evolution Series, 1986

Format	Video
Annotation	The Hardy-Weinberg model is used to focus on how the equilibrium of a population may be disturbed. Stabilizing, directional, and disruptive evolutionary phenomena are examined, as well as the theory of random genetic drift.
Price	Contact distributor
Distributor	ACCESS Network VC289505

Remnants of Eden: Race to Save the Planet Series, 1991

Format	Video (60 minutes)
Annotation	The program addresses the difficult balance of protecting the diversity of species on the Earth and managing the needs of growing human populations.
Price	$149
Distributor	Magic Lantern Communications Ltd.

DISTRIBUTOR ADDRESSES

DISTRIBUTOR ADDRESSES

- ACCESS Network
  Media Resource Centre
  3720 - 76 Avenue
  Edmonton, Alberta
  T6B 2N9
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